ORIGIN, STRUCTURE, AND PHILOSOPHY
OF
JOB EVALUATION

DISSERTATION
Presented in Partial Fulfillment of the Requirements
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By
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Approved by:
The whole area of wage determination, and the problem of wage differentials and inequities in particular, has become complicated in the present day type of industrial economy. Job evaluation is one attempt to solve some of the problems of wage differentials and inequities. In order to place these problems in their proper setting, a survey of the historical aspects of wages has been presented in this dissertation, as an introduction to the main topics which deal with the underlying concepts and basic problems of job evaluation. Special attention has been given to the scientific method and research phases related to job evaluation, which point the way to future developments in the field.

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John Thompson Elrod
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CHAPTER I

INTRODUCTION

Job evaluation, as conceived and applied in the economic society of today, is a recent development. Prior to World War I the idea of systematic wage determination was beginning to form, but it did not crystalize until the early 1920's. Even then, its spread and adoption was relatively slow. Not until the late thirties, when, with the rapid growth of industrial type unions, was general interest evoked. World War II and subsequent events further accelerated the use of job evaluation. But this method of determining wage differentials did not originate by accident; rather it was the result, or the contingent phenomenon, of many forces that either had been in effect for centuries, or were stimulated by changing economic, social, and technological developments, or both.

It is the purpose of this study to trace the historical evolution of wage differentials, to analyze some of the forces affecting and contingent to wage differentials, to present the fundamental philosophy, theories, and the practices of job evaluation, and finally to investigate the role that science and the scientific method have played in job evaluation, placing further emphasis upon the scientific approach in relation to job evaluation.
I. DEFINITIONS

Job Evaluation. There are a number of definitions of the term “job evaluation.” These usually state that job evaluation is a process, technique, or method, and define the concept in operational terms. Job evaluation has to do with relative job worth, that is, each job (and this term requires definition) is assigned a value, or position, on a scale, which represents its relationship, in terms of certain characteristics, to all other jobs with which it is associated in a given organization. The definitions of job evaluation usually include the idea of “systematically” performing the various steps in the job evaluation procedure. This idea of “system” implies that a degree of consistency and objectivity will be obtained thereby. Further examination of definitions reveals that job evaluation procedures are designed to achieve an “equitable” wage structure. This is closely allied to the relative job worth idea referred to above, and implies that whatever relationships are established by this technique will (or should) be equitable. To put a definition concisely, the following is taken from the Production Handbook (1):¹

¹ Numbers in parenthesis refer to Bibliography listing.
Job. The term "job" is used to mean "a collection of tasks, duties, and responsibilities regularly assigned to and performed by a single individual" (35) or a group of individuals performing essentially the same duties, and where these individuals would be capable of interchanging positions without substantially changing tasks, duties, or responsibilities. As would be expected, there are many variations and deviations from a strict interpretation of the above definition, and each organisation must develop definitions to meet its own specific requirements.

Importance of Job Evaluation. Job evaluation, as an abstract concept, is important for several reasons. First, a large number of companies as well as government agencies and non-profit organisations, particularly among those of medium and larger size, have adopted job evaluation as a method of determining relative job worth, although it may not be the final or sole determinant. This may appear to be obtuse reasoning, but the fact remains that job evaluation is a current phenomenon, and one that has widespread acceptance and use. Secondly, its importance is such that certain government regulations pertaining to wage and salary stabilization specifically refer to job evaluation and classification in regard to controlling wage adjustments. It is also
that government agencies are among some of the largest organizations utilizing systematic wage determination procedures. A third reason for considering job evaluation as important is that it offers possibilities in solving some of the vexing and costly problems of wage and salary administration, industrial relations, technological changes, and certain other phases of modern industrial society. From another viewpoint, job evaluation is important to the critical analyst of such techniques, because they (the techniques) are beginning to emerge from the era of empiricism into the light of scientific inquiry. The development of this phase will receive considerable attention in this study. There has been a tendency to impute scientific precision or method in certain job evaluation plans which is not justified. This has been the case with the so-called "point systems," and is not only misleading, but not in accordance with the facts. It will be the purpose to explore in some detail the possible applications of the scientific method and research in job evaluation.

The general approach of this thesis has been broad, rather than an intensive investigation into any one particular phase of the subject. An attempt has been made to present an integrated, coordinated study of job evaluation as a concept, emphasizing the fundamental problems and theories, only bringing in detail procedures and features of specific plans where necessary to illustrate a historical or basic
point. Thus, one will not find instructions on how to install a given plan, or what type of form to use in collecting data in a wage survey.

The sources of the material used have been primarily libraries, including the Library of Congress and the Library of the Department of Labor in Washington, D.C. In addition, conferences with such acknowledged pioneers and experts in the field as Mr. S. L. H. Burk, with labor research personnel, with management consultants, and with social scientists, plus personal experience with the development and installation of job evaluation systems, have contributed to the total sum of information and ideas that are presented herein. Certain conclusions have been reached which are presented in the final chapter.
CHAPTER II

HISTORICAL DEVELOPMENT OF WAGE DIFFERENTIALS

This analysis of wage differentials, in addition to that of classical Greek and Imperial Rome, deals primarily with the English (from about 1200 A.D.) and American economies because of their interrelation, historically and ethnically. The history of French, Dutch, and German industry is enlightening and useful as background and complementary information. The present American wage situation owes more insofar as theories, policies, and thought are concerned, to the British than to other countries. It is significant that at the very time when America was struggling for independence from Britain, that the industrial revolution was getting under way in England. The invention of the steam engine and textile machinery, plus the appearance of Adam Smith's "Wealth of Nations," was to have a profound effect on the way of life in these two countries, as well as in others. England had strong ties with Continental Europe, and took a great deal of its philosophy from the ideas of the other Europeans and was also influenced by the thoughts of Ancient Greece and Rome, especially the latter. For example, the nature and purpose of the English guilds paralleled that of Continental guilds. America, of course, was strongly influ-
enced by British philosophy and industrial developments, especially in the earlier stages of growth. However, this country was to take the lead over Britain in industrial progress, so that today industrialists of that country look to the United States for leadership in many areas.

I. WAGE DETERMINATION IN ANCIENT GREECE

Relationship of Ancient to Present Philosophies.

Before discussing the factors of wage determination in ancient times, a pertinent observation by Humfrey Mitchell (The Economies of Ancient Greece (30)) regarding the Greeks, warns that: "In art and philosophy, poetry and the drama we may draw very near to them (ancient Greeks), for such are timeless and the spirit of man is eternal. But politics and statecraft, social systems and economic expedients are of the age of which they are a product; and we of another age cannot enter fully into the spirit that prompted them." (30, p. 1)

Likewise, H. E. Barnes (The History of Western Civilization (2)) points out that "resemblances, are mainly external, superficial and fallacious" when he discusses the "fall" of the Roman social, economic and political system, in relation to conditions in our time. He states that: "Rome gives us no more clue to our present difficulties and prospects than a Roman chariot would offer with respect to the mechanism of a Rolls-Royce automobile of the latest design." (3, p. 356)
It is necessary to analyze carefully any economic concepts and data pertaining to wages in light of the philosophy as well as the actual conditions extent during antiquity. Those factors affecting wages which might be classed as belonging to the philosophical may have bearing on the present day approach. However, if the basic philosophy has changed, then people must be doubly wary today of accepting ideas as valid, just because they appeared to be valid in another age.

Barnes (3) makes an important and fundamental point which derives from prehistoric times when he states:

One of the most important contributions of primitive economics and property ideas to later times is rarely discussed in formal anthropology. This was the origin of the distinction between predatory and productive activity - the former being honorable and the latter relatively base. The tribal chieftain attained his power and prestige not by useful labor, which was assigned to women, dependents, and slaves, but by acts of aggressive warfare and economic exploitation. The highest prowess was demonstrated by the ability to refrain from work and to consume the largest amount of the work of others. This "invidious and honorific distinction" attaching to wealth became the dominant incentive to ownership in developed primitive society, and has remained so down to our day. (3, p. 56)

This thesis is more fully developed by Thorstein Veblen, whose contributions to economic thought will be discussed below, (see pages 79, ff.) in relation to the modern, present day approach to wage determination.

Citizens. The "distinction between predatory and productive activity" was strongly ingrained in the philosophy
as well as the political and economic institutions of the early Greeks and Romans. For example, three separate classes, divided by political and economic lines, existed in Greece. These were citizens, Metics, and slaves. To the citizens fell the responsibility of government, an activity requiring a considerable portion of their time. Only citizens could own land, and they are also found in almost every profession or trade, although in such skilled trades as carpentry, stone masonry and similar work, they were usually outnumbered by the Metics and suffered in competition with them. Only a citizen in the most destitute circumstances would accept work as a laborer. He (the citizen) preferred to consider himself an aristocrat, and as such he thoroughly disliked manual labor. His interests were in politics, warring, philosophy, drama and gossip, and since he was paid for government service such as jury duty and attendance at the assembly, he developed a prejudicial attitude toward manual work. Nevertheless, many citizens were successful artisans and businessmen, finding time for their tanning or baking as well as for government duties.

As Barnes (3) points out, "It is a common error to represent the Greeks as people who all looked down upon manual labor as degrading. It is rarely made clear that the Hellenes held many different views on the question." (3, p. 209) Manual labor, as such, was not the object of censure,
except to the extent that it kept a citizen from his civic duties and other activities requiring considerable leisure time. Thus, according to Jules Toutain (*The Economic Life of the Ancient World* (48)) workmen from the several classes were frequently found working together. The usual arrangement, however, was for a citizen who followed a particular craft, to own and supervise the workshop, using Metics and slaves to do the work. Often a Metic, and on occasion, a slave, would have responsibility for the management of the workshop. This same type of situation (without slaves, of course) is found today, where "leading" citizens, the owners or principal managers of business, "leading" professional and educational people, are expected to take time from their business and devote it to "civic" activities such as community chests, chamber of commerce meetings, etc. A person, on the other hand, engaged in common or skilled labor, even with the shortened work week, is not generally expected to be absent from his machine or desk to take part in civic functions. It is interesting to note that within the past 20 years, there has been a trend toward breaking down this age-old custom, so that union leaders and other representatives of the "laboring" class are taking a direct part in civic affairs along with professional and business leaders.

Toutain (48) bears out the theory of Barnes referred to above regarding the attitudes of the Greeks toward work.
He sums up this attitude as follows:

The Greeks distinguished between the wealthy, powerful manufacturer and the plain artisan who lived from day to day, the employer and the workman, and M. Guirand very justly says: 'This distinction is so much in accordance with the nature of things that it is to be observed in all times and in all countries... and labour was not regarded with any disfavor in consequence'. (48, p. 60.

Metics. The two other classes referred to above, the Metics and slaves, fostered (or were the result of) this attitude regarding work. The Metics were foreigners ("barbarians") who were welcomed to Greece, and ex-slaves who had been freed, but were not allowed certain privileges accorded citizens. The Metics were found among the skilled artisans, the traders, the bankers and the other commercial and industrial occupations of the day. Oddly enough, the majority of the Metics were actually Greeks who had left their native cities (citizenship applied to cities, not to the entire country) because of financial or other reasons, and moved to another city (wherein they were classed as Metics). Thus, the "people" often outnumbered the "citizens," and since they conducted the business and industrial life of the cities they were provided encouragement, but not citizenship.

Slaves. The third class, slaves, may have numbered as many as citizens and Metics combined, and constituted the

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basic productive group in Grecian economy. The manual laborer, in an era of no machines, provided the only means of doing the rough, hard work of producing goods, constructing roads and buildings, and performing the drudgery jobs of the day. The wars resulted in the capture of large numbers of slaves, and the Greeks obtained others through "trade."

The acceptance of slavery as an integral, necessary and even proper part of their political and economic life was never seriously questioned by these early Greeks. Mitchell (30, p. 149) states that, "Plato's ideal Republic was founded and rooted in slavery," and that Aristotle's "philosopher was to rule, in his transcendent wisdom, over a society not of freemen alone, but also men and women accounted incapable and, therefore, unworthy of freedom." It is no small wonder that, influenced strongly by the philosophies of Plato and Aristotle, the Western world continued to use slave labor more or less extensively until less than 100 years ago. The slave was considered as an indispensable part of these various countries because of the economic and political conditions then in existence. The free citizen had obligations to his government to go to war, to serve in the Assembly, and otherwise to occupy himself, so that in order for the manual labor to be done, slaves were considered essential. One cannot escape the conclusion that the philosophies of Plato, Aristotle, Xenophon and others were shaped to a large extent
by the economic conditions and practices of the day, when it is realized that even Plato could not imagine or conceive an "ideal" state not based on slavery.

**Division of Labor.** Other facets of economic and industrial life in the four or five centuries before Christ also shed light on the factors affecting wages. As the Greek cities grew in size, the family became less important as an economic unit, and specialization and division of labor came into being. Of course, the Greeks were not the first to utilize these ideas (and it cannot be imagined that the arrangement involved anything other than a natural consequence of economic factors), because we find evidences of specialized crafts such as cabinetworking, masonry, spinning, dyeing, etc. before 3000 B.C. in Egypt (3, p. 99). By Hammurabi's time (he of the Code) 4000 years ago in Babylonia, a high level of craftsmanship was attained in many specialized fields, particularly the manufacture of bronze articles, tanning, weaving and dyeing. (3, p. 129). Hammurabi's Code set forth detail regulations pertaining to quality, craft responsibility and even payments to workers.

By the time of the classical period in Greece (sixth to fourth centuries B.C.), the ideas of division of labor and

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1 Athens may have reached a size of 200,000 (including nearly 92,000 slaves) although some estimates are higher. However, only 20 cities claim as many as 10,000 citizens, while the majority had less than 5000. Slaves were not normally counted in the population. (3, pp. 190, 213)
of specialization were well recognized. The fact that Greece
could not support itself by its own agricultural products,
but had to rely on industry to produce goods for export in
order to obtain wheat and other staples, from abroad, fos-
tered a growth of "factories." These actually were workshops,
the largest on record employing only 120 workmen (48, p. 58).

The immortal philosopher Socrates, speaking through
Plato in the Republic,¹ says:

'More things are made, and they are made
better and more easily, when each man does the
work to which he is suited'; or, again: 'The
ploughman must not himself make his plough for
his own use, if he wants it to be well made,
nor his mattock, nor the other implements used
for tilling the soil. It is the same with the
architect, who needs many tools, and with the
weaver and with the shoemaker.'

Reference to such modern writers as Henri Fayol reveals
similar statements quoted in the Production Handbook as
follows:

Division of Labor. Division of labor is a
law of nature. . . . The object of division of
labor is to produce more and better results with
the same amount of effort. The workman who is
always making the same part, and the manager who
is constantly dealing with the same problems,
acquire a skill certainty and accuracy which in-
crease their output. On the other hand, every
change in occupation involves an effort of
adaptation, which reduces production. (1, p. 1363)

Examination of the two quotations reveals striking

¹ Quoted by Touftain (48, p. 58) from the Republic, 11, 5, 1 (370).
similarities, but also fundamental differences. Socrates would probably question that "division of labor is a law of nature" in the sense and with the objective stated by Fayol. The philosophy expressed in the Republic represents an attempt to compose a utopian state, containing ideas of social division of labor and social planning (48, p. 224). Although Barnes (3) contends that Plato's writings "directed the mind from an analysis of the practical realities and turned it towards futile speculation about imaginary metaphysical or mystical issues," it would appear that his (Socrates') statements quoted above reveal a practical insight into the realities of production. The impracticality seems to lie with Fayol in narrowing the concept of division of labor to a man "always making the same part" or a manager "constantly dealing with the same problems." To follow this a bit further, it may be that present thinking narrows the field of view and in attempting to sharpen the focus on the object at hand, much of the total (social) picture is blocked out of job evaluations.

Craft Guilds in Greece. It would not be inaccurate to say that production of goods in Ancient Greece should be classified in the "handicraft" stage. Another phenomenon of this stage, other than those mentioned above, was the development of craft guilds. Guilds, or associations, had flourished even before the Greek period of affluence (the
In Egypt and Mesopotamia, the earliest guilds had religious and political purposes, but not, except indirectly, economic objectives. The craftsmen (including employers, masters, workmen and even in some cases, their families) of each specialized trade banded together to observe religious rites related to their occupation, to provide for burial of their members, and to perform other similar functions. Since industrial activities were closely regulated by the state, these guilds provided a convenient method of control and collection of taxes (48, p. 137).

In Greece, the importance of artisans increased to the point where they represented a majority of the assembly during Plato's time. Although the guilds were not primarily political in purpose (differing from the highly controlled guilds of Egypt), they did form an important link between the industrial and political life of the country. Some authorities (30, p. 142) have claimed for the guilds the distinction of being responsible for the industrial peace of the Ancient World. This would appear a bit naive when it is considered that the guilds were either under complete state control, or, as in Greece, independent, and lacking in any widespread organization. This latter condition would limit the possible activities of guilds to those of fostering "a spirit of brotherhood and common religious observance." (30, p. 142)
Then, the fact that many wars have been waged to secure trade and other economic advantages, it is difficult to say that the industrial history was peaceful. True, there were no record of strikes on any large scale, but this can be attributed to the fact that industrial establishments were small, with the owner frequently working alongside his employees (both free and slave). Also, the fact that slave labor was employed extensively, would indicate that the master usually had control of the situation.

"Wages" of Slaves. The foregoing discussion presents the background for a more detailed examination of wages paid to various classes and trades. The impact of slave labor on wages cannot be over-emphasized. It must also be remembered that slaves not only performed the most menial of manual labor, but records show that many were also skilled craftsmen, and in some cases actually supervised the work in a pottery, for example. A widespread use of slaves occurred in mining operations, where the least desirable slaves worked under intolerable conditions. Since slaves were "supported" by their owners, the cost of living enters the picture. Although the evidence and records are obscure and misleading (it is even difficult to arrive at an accurate and adequate "cost of living index" today), a "best estimate" by Mitchell (30, p. 133) is that a free man could support a wife and one
child on 272 drachmas a year in 422 B.C. At this time, all authorities agree the wage for a laborer was one drachma a day, thus leaving a small margin for emergencies and luxuries. However, to return to the cost of slaves: in the latter part of the fourth century B.C. (when a day's wages had risen to approximately 2 drachmas) Mitchell (30, p. 163) estimates the total cost of owning a slave was 250 drachmas a year, including interest on the investment, clothes, etc. Compared to two drachmas a day for free labor, it would appear quite advantageous to own slaves. Undoubtedly, some of the advantage was offset by lower efficiency of the slave, the possibility of lost time due to illness, injury and even escapes.

A comparison of the cost of purchase for slaves with various abilities is interesting. At the close of the fifth century B.C., the cheapest male slaves used for common or mine labor sold for 130 to 150 drachmas, cabinet makers 200, armorers 300 to 600, and a man qualified to assist in building and construction work, 500 to 600. In addition, slaves

1 Professor Breasted in The Conquest of Civilization (9, p. 299) gives the system of money as follows:

6 obols = 1 drachma (18-24$, 1938 value)
100 drachmas = mina (pound)
60 minas = 1 talent ($1125.00, 1938 value)

Coins were silver, and in the sixth century B.C., according to Breasted "a sheep cost one drachma, an ox five drachmas, and a landowner with an income of five hundred drachmas ($100) a year was considered a wealthy man."
from various countries brought different prices. For example in 414 B.C., slaves from seven different countries brought prices varying from 105 to 301 drachmas. (50, p. 162) It may be that some nationalities were preferred to others, but it is also quite probable that other factors (health, age, skills, etc.) affected the prices. Thus we have no substantial evidence that nationality was the determining factor. Although these initial costs of slaves varied, indicating a value judgment based on skill, trade, and physical qualities, the wages paid to free laborers did not show such marked variations. As mentioned above the daily wage for workers was one drachma. However, during the fourth century B.C., both prices and wages rose, and Mitchell (50, p. 131) reports "at Eleusis\(^1\) in 329-328, labourers received 1 1/2 drachmas, sawyers 2, bricklayers, carpenters and plasterers 2 1/2." He states in a note that the evidence regarding actual wages is insufficient, and he finds it hard to believe that the more highly skilled craftsmen were not paid higher wages (30, p. 131n). One explanation of this might be that slaves performed work in all trades and levels, including supervision, and the only difference in their expense, or part of the productive cost, was in the original purchase price. This difference, amortized over a number of years (the productive

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\(^1\) About 15 miles from Athens on the coast.
life of the slave), was a relatively minor part of total costs. Since the citizen worker was competing, in a sense, with slave labor, the wages of skilled craftsmen were depressed accordingly. Thus, while the unskilled free laborer got along comparatively well (provided he found steady employment) at something better than subsistence level, the more highly skilled workers, unless they were their own masters, did not fare much better. The slave situation tended to hold all wages to a low, but decent, standard.

Wages of Metics. The wages of Metics were handled on the same basis as that of citizens, although there seems to have been some discrimination in favor of the citizens. As pointed out above, (p. 10), citizens, Metics and slaves frequently worked side by side. Mitchell (30, p. 126) gives an example, (not only comparing citizens to Metics, but concerning piece work, which was widely practiced) of two Metics and three citizens on the job of shaping beams. The Metics shaped 84 and 180 feet of beams for a total wage of 66 drachmas, while the citizens did 9, 47 and 68 feet respectively, for which they received 51 drachmas between them. Simple calculations show that the Metics earned 0.25 drachmas per foot on the average, while the citizens earned 0.27. These two figures are very close, and considering the possibility of error, or rounding off for payment purposes, it appears that citizens and Metics received essentially the
same pay for the same type of work. Carrying the calculations a step further, and using one drachma per day as the base wage, the number of feet of beam shaped in one day by one man was four.

II. INDUSTRY OF IMPERIAL ROME

Prior to the Middle Ages, the Roman Empire and Carthage, in addition to Greece discussed above, had highly developed civilizations. The Roman Empire particularly, in the first two centuries of the Christian era, made considerable progress industrially. There were, of course, others which showed evidence of industrial activity, such as Gaul, both before and after the Roman conquest. Pre-Roman Gaul, for example, was noted for its metal working and woolen manufacturing, and it is claimed that soap was the invention of the Gauls. However, it will suit the present purpose if the labor and wage situation in Rome is examined to complete the analysis of the ancients' approach to this problem.

Many similarities exist between Roman and Grecian industrial characteristics. Both grew out of urbanization and a need for products to use in trade for food and other basic items. Both relied heavily on slave labor, but there seems to have been no equivalent to the Greek Metoic who was so useful in business and industry. The division between the wealthy business men, the landed aristocracy, and the
"maasses" was more severe during the Empire than in Ancient Greece. The living conditions of the workers were deplorable, and employment was not as steady as in the Greece of an earlier day. Wages were depressed by the extensive use of slave labor, and the fact that the spread of craft guilds was a predominant factor in industrial life, seemed to have little effect on improving economic conditions of the workers.

Specialization. Specialization of industry advanced further than previously known in Greece and elsewhere. Barnes (3, p. 302) reports that more than eighty distinct crafts were in existence, and Toutain (48, pp. 299, 300) states that general cobblers had one guild, and then the makers of three different types of shoes or footwear formed separate guilds. Another development that fostered industry and specialization, was the use of "capitalists," or men with large funds to establish factories of perhaps two to three hundred workers, in such fields as pottery, glass making and textiles. Some large companies were under contract to the state, or owned by the state, especially those related to mining, salt production and the like.

The attitude of the ruling, aristocratic and intellectual classes toward work and all endeavors other than state-craft, agriculture, and arts is best summed up by Cicero
(30, p. 309)\(^1\) as follows:

All gains made by hired labourers are dishonourable and base, for what we buy of them is their labour, not their artistic skill; with them the very gain itself does but increase the slavishness of the work. . . . Again, the work of all artisans is sordid; there can be nothing honourable in a workshop.

This attitude is even more harsh than that of the early Greeks, and represents a more materialistic and vulgar outlook and philosophy on the part of Rome's elite. Another manifestation of the different attitude was to be found in the demand for the luxurious, and for brutal sports. The wealth to support this way of life came largely as the result of military conquests, and not a solid foundation of production at home. The situation described above, unsatisfactory (even from the free artisan and craftsman's standpoint) at the height of Rome's world domination, deteriorated during the third and fourth centuries, leading to the "fall" of Rome. Apparently at no time were wages paid to free laborers much above the subsistence level, and as conditions became worse, more citizens turned to crime, joined the army, or even became slaves. The guilds, composed of free artisans, came under the complete control of the government. Each man was "bound" to his trade, and his wages and activities were subject to orders and administration by the state. As a result, productivity dropped to new lows, only aggravating

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It should be pointed out that the guilds (or "colleges," as they were known) had only a limited similarity to the guilds of the Middle Ages and practically none to the modern trade union. Their purpose, even in Rome, was social and religious, more of a fraternal order of free craftsmen belonging to the same trade. Doctors, teachers and other "professional" people also formed "colleges." The guilds of the Middle Ages will be discussed below (see pages 32-40).

III. SUMMARY OF WAGE DETERMINATION IN ANCIENT TIMES

By the end of one of the great eras of history (the close of the Roman Empire), certain currents of thought and attitudes appear to be well defined as regards to the economic relationship of workers to other elements of society. First was the idea that manual labor was not a worthy objective or pursuit. This idea was especially prevalent among the upper classes, intellectuals, military, and ruling groups. Only in very recent times has the "dignity of labor," the "nobility of work," been accepted to any degree. Still today, one of the greatest reasons for a person to go to college is so that he will not have to work with his hands. College graduates feel as though they are degrading themselves if they are asked to do dirty, hard, physical labor. The attempt to attach some honor to manual labor is probably, among other
things, the result of the realization that organized labor has considerable power, and therefore prestige, and plays an important part in political and economic life.

Another underlying factor that has greatly influenced attitudes toward workers, is that for many centuries slaves were the accepted means of getting the arduous work of the world accomplished. Anyone who performed manual work, even though he were a free citizen, was considered as performing slave's work. Even today, the term "slave labor" is used in this country to attack and deride such a law as the Taft-Hartley Labor - Management Act. The purpose here, of course, on the part of certain labor leaders is to get the general public to think that this Act would impose certain restrictions upon workers, tending to enslave them. Actually, probably no one was fooled by this tactic, but in a subtle way it implied that owners and managers (capitalists) still have an attitude toward workers that resembles the attitude of the days when slavery was the accepted practice. This attitude can be traced to the present time, where ample evidence can be presented to indicate that owners have actually considered their employees, not as individual human beings, but as just another element, along with machinery, plant, materials, etc., required to produce goods.

An excellent example of the attitude of the upper classes toward those who labor is found in the problem of
industrial health and safety. The ancient Greeks, Romans, and Egyptians were not too concerned with the health and safety of their slave laborers beyond the fact that there was an investment to be protected. Human beings, considered as "property," received no more consideration than an equally valuable piece of equipment or an animal. However, Xenophon, quoted by Mitchell (30, p. 154), discusses the treatment accorded slaves as follows: "...for where a naval power exists, it is necessary from pecuniary considerations to humour the slaves, that we may receive the profit from their work, and to indulge them in a liberal way of living." The Roman attitude, as shown above, was more severe and less humanistic.

It will be shown that this attitude existed among owners and operators of industrial establishments up to present times. Although no company today would publish such a policy, experiences and personal observation leads to the conclusion that an understood or unwritten policy might be stated paraphrasing Xenophone: "It is necessary from dollar and cents considerations to humor the workers, that we may receive the profit from their work."

Fortunately, within the past quarter of a century, enlightened managements have undertaken to implement humanistic policies regarding the health and safety of workers. For example, the General Foods Corporation has a policy that safety precedes cost factors in the introduction of new devices, methods of improvements or new equipment.
IV. WAGES IN THE MIDDLE AGES

After the decline of the Roman Empire during the third and fourth centuries of this era, a period of some 800 years elapsed, and was known as the Dark Ages. The economic organization most common in the Western World was feudalism. This period has no important significance for an analysis of wage determination because labor was predominantly performed by slaves and serfs, or vassals. The locale was the castle and surrounding lands which were worked by the serfs and vassals. The economy was principally agricultural, and practically all needs were supplied locally.

Beginnings of Towns. During the period of eleventh through the fourteenth centuries, a trend of outstanding importance took place. This was the rise and development of towns, the true beginning of our modern age. It was only when the Greek and Roman economies progressed to the stage where people grouped themselves together for mutual benefits that we find the rudimentary forms of industry. Thus it was that in the latter part of the Middle Ages came this all important basis for the rise of an industrial civilization. There is a question of cause and effect here, but it would appear to be academic. The fundamental fact is that urbanization and industrial progress were closely interwoven in the complex relationships eventually leading to the present form of economy.
In feudal economy the manorial estate was reasonably self-sufficient and relatively few people were required for the maintenance of existence on the estate. However, in the eleventh century the commerce and industry that was developing required some more stable arrangement than these small manorial estates. Thus, the merchants and craftsmen in that time formed voluntary associations in order to combat the feudal control over the towns, and although these first attempts were unsuccessful, it was the beginning of the new social and economic movement that was to eventually result in the establishment of such towns as London, Paris, etc.

It is difficult, as mentioned above, to state whether industry and commerce was the result of the towns or whether the towns developed as the result of industry and commerce. Whichever the case, however, the town became the center of industry and commerce and such developments as division of labor soon appeared. It must be remembered, however, that this development of towns did not take place simultaneously all over Europe, and although feudalism eventually disappeared, the aspects of a small self-sufficient community existed in many places for several centuries. It is therefore impossible to set any exact date when towns came into existence. The interest herein, insofar as industrial labor is concerned, therefore, is directly associated with the development of towns, because industry as such does not exist except where a
relatively large number of people are able to gather together in one place.

Several other phenomena gradually developed which had an effect on the problem of wages. One was the growing consciousness of group relationships apart from the family. The guilds (of which more will be said later) were a manifestation of this group or social force. It will be recalled that the guilds of ancient Greece and Rome were primarily social and religious organisations.

**Role of the Church.** A fundamental change that occurred during this period of the latter Middle Ages was the viewpoint on religious matters. Through the thirteenth century the Roman Catholic Church, especially the Pope, held a powerful, even dominant, position in Europe. This power not only extended to men's souls and minds, but to secular, economic and political aspects of life. It is important to realize that the dominant concept of the church was that the proper occupation of man was the contemplation of God. The physical wants and desires of man were secondary. The intellectual development of the common man was restricted to the teachings from the Bible. However, the church completely changed the Western world's concept of labor and promulgated the idea "that labor was compatible with the dignity of a free man." (3, p. 699) Barnes clarifies this statement as follows:
It should be made clear, however, that the Church never "glorified" labor, as has frequently been contended. It was rather inclined to emphasize the penitential character of manual effort. It was a necessary discipline to avert worldliness and promote humility and spirituality. The punitive rather than the ennobling aspects of work were uppermost in the eyes of the Church. It was no forerunner of Ruskin, Morris, or Tolstoy. (5, p. 699)

Since slavery and the use of slaves (and serfs) for labor has been an important factor in determining the status of labor, it is interesting to note that the Church in the medieval period actually used a large number of serfs and not a few slaves on its extensive manors, monasteries, etc. However, the Church was opposed to trading in slaves and the enslavement of Roman Catholics, and commended the freeing of slaves. Thus the concept of slavery (serfs, bondmen, etc. included) had to wait for a later time to be effectively eliminated as an integral part of the economic order.

Beginnings of Scientific Thought. Another profound development in the latter part of the Middle Ages, and one that was to assist the decline of the institutions and concepts of medievalism, was the intellectual awakenings and the beginning of scientific thought.

One of the most potent influences on the development of the scientific, technical and industrial forces of the late Middle Ages and on into the Modern Era was the introduction of mathematics to the Europeans by the Muslims. The
Muslims studied many of the scientific, medical and philosophical works of the classical Greeks, as well as the learning of India and Arabia. This learning was then passed on to the Europeans, principally by way of Spain. One of the first scientists to appear in this Age was Roger Bacon (1214-1294). Although Bacon's background was in the true Medieval interest, he did point out the inductive method of analysis and wrote of certain inventions in optics and navigation. From these beginnings, science and technology developed, culminating in the industrial revolution of the late 18th, 19th, and 20th centuries.

**Beginnings of Capitalistic Economy.** Another predominant characteristic that is a development of the latter Middle Ages is the substitution of what is known as a capital economy for a "natural" economy. In other words, the rise of capital and credit affected the whole life of the peoples of that time and was to play an important part in the breakdown of the feudal system. Without a money economy it would have been impossible to develop the trade and national states that seem to be necessary to support industry on any scale at all. The merchants who were the operators of this money or capital economy and the trade and commerce incident to it, found that it was necessary for them to join together in what is known as merchant guilds. The members of these guilds banded together for the promotion and protection of their common
economic interests. In protecting these interests they estab-
lished regulations governing the times, places, and prices
at which they could sell their goods. They defined unfair
business practices, short weights, etc., and all such viola-
tions were severely punished by the guild itself.

**Guilds.** For the guilds to operate successfully it was
necessary that they retain a trade monopoly in their particu-
lar line. In their initial development, the merchant guilds
included the craftsmen or artisans. However, it was not long
before the craft guild was a distinct facet of the late Mid-
dle Ages economy. In Western Europe the development of these
craft guilds took place between the middle of the twelfth cen-
tury and the middle of the fourteenth century. The craft
guilds, like the merchant guilds, specialized within a particu-
lar line or craft and the craft guilds also attained impor-
tant political prominence. Whereas the merchant guilds
included those people involved in commerce and trade, the
craft guilds included the industrial "classes."

Barnes (3) states that: "The economic functions of the
craft guilds were: (1) to regulate wages; (2) to fix prices
and conditions of sales; (3) to determine the hours and con-
ditions of labour; and (4) to inspect workmanship and the
quality of the materials. In all this was involved the local
monopoly of each particular craft." (3, p. 667) It is also
important to note that the membership of the craft guilds
included apprentices, journeymen, and masters, the latter who were usually the owners of the particular businesses involved. Since the number of apprentices was limited and the time for apprenticeship was specified frequently at seven years, the apprentice could look forward to becoming a journeyman; then, the journeyman, after a period of time, could become a master. During the Middle Ages there was actually little distinction between the journeyman and the master, although the journeyman received somewhat less in earnings. Nevertheless, since he could look forward to becoming a master, this difference did not draw a sharp line of distinction between the two.

The importance of the guilds, when they were at their height in the latter part of the Middle Ages, is indicated by the fact that, as Renard states: "It naturally follows that their (the guilds) relations with the authorities were greatly modified in the towns in which they created or were themselves the authorities. . . . In those days the guilds were the units for elections, for the militia, and for taxation; they judged their dependents without appeal; they expelled, or reduced to the rank of passive citizens, those who were not inscribed on their registers; they decided the questions of taxation, peace, and war, and directed the policy of their town, whose internal and even external history is essentially one with their own." (37, pp. 56-7) In these towns of the Middle Ages one of the chief problems in regard to guild operation was to decide how the different groups of guilds should divide the government
among themselves. In other words, there might be twenty or more guilds such as weavers, shoemakers, butchers, bakers, etc., in the town. Renard points out that: "Such was the case at Florence where from the year 1293 twenty-one...craft guilds nominated the priors and the other supreme magistrates of the city." (37, p. 56) As might be expected the order of social importance which was assigned to these various guilds became a matter of some interest in those days. Again quoting from Renard:

It appears that this classification was based on three different principles which I will call the aristocratic, the plutocratic, and the historical; that is to say, the status of a profession seems to have been dependent on whether it was more or less honourable, lucrative or ancient.

The place of honour was reserved for those crafts in which brain work took precedence over manual work. They were regarded as more honourable evidently because in the dualistic conception which governed Christian societies, spirit was placed above matter, the intellectual above the animal part of man. It was for this reason that the professions which demanded brain work alone were called from that time onwards "Liberal," as opposed to manual labor which was called "servile," an expression which the Catholic Church has piously preserved to our own days. (37, p. 57)

In this connection Renard lists some of the professions in the following order of social distinction: professors of the different faculties, judges or doctors of law, the proconsul or head of the corporation, doctors, bankers, money-changers, wholesale traders, woolen merchants and the like, architects,
carpenters, goldsmiths, apothecaries, image makers and sculptures, and among the lesser crafts and guilds were the innkeepers, butchers, bakers, etc. It will be noted that these guilds included the merchant guilds as well as the craft guilds and that the so-called "honourable" and also the "lucrative" guilds or professions were the ones that demanded the highest recognition.

Although it may be expected that there was a large variety of types and sizes of guilds, two can be taken as being characteristic. In the first case, the small industry type of guild, which constituted the majority, was a relatively simple organization and was established somewhat as described above with the three classes of apprentice, journeyman and master. Each craft or guild was more or less an integrated unit working from the raw materials to the selling of the finished product. There was relatively little trouble as we know "labor trouble" today in these types of guilds.

Even so, towards the end of the thirteenth century, laws and regulations were passed forbidding the combinations of workers (see Renard, 37, p. 18). However, these combinations of workers, journeymen particularly, had no real effect on the economic condition of their class until sometime later.

On the other side of the picture, however, is found the proto-type of present-industrial organizations, in what were called the large industries and their guilds. In these
great industrial guilds, the masters banded together into companies and developed a remarkably autocratic and capitalist character. As pointed out by Renard, the hierarchy of owners, management and labor was similar to present-day industrial organisations:

The woollen industry offers the most remarkable instances. The manufacture of cloth (which was the principal article of export to the Levantine markets) was the most advanced and the most active industry of the Middle Ages with its appliances already half-mechanical, supplying distant customers scattered all over the world. It was the prelude to that intensity of production in modern times which is the result of international commerce.

The wholesale cloth merchants no longer worked with their own hands; they confined themselves to giving orders and superintending everything; they supplied the initiative; they were the prime movers in the weaving trades, which depended upon their orders; they regulated the quantity and quality of production; they raised the price of raw material, and the workmen's wages; they often provided the appliances for work; they undertook the sale and distribution of goods, taking the risks, but also the profits. Already they were capitalists, fulfilling all the functions of captains of industry.

What became, then, of the intimate and cordial relations between masters, journeymen and apprentices? The guilds began to assume a character unlike anything which could exist among the clothiers or blacksmiths for instance. This new state of affairs suddenly arose at Florence in the Arte della Lana. At some periods of its existence this guild had a membership of 20,000 to 30,000 but it was like a pyramid, with a very large base, numerous tiers and a very small apex. At the summit were the masters who were recruited entirely from among the rich families and formed a solid alliance for the defence of their own interests. Forced to guard against the perils which threatened their business of every hand —
the difficulty of transport, a foreign country closed to them by war or by a tariff, the jealousy of rival towns, — they tried to recoup themselves by employing cheap labour, and remembering the maxim 'divide and rule,' they ranked the workmen they employed in different degrees of dependence and poverty.

Some classes of workers, such as dyers and tailors, were affiliated to the arte under the name of inferior membri. True, they were allowed certain advantages, a shadow of autonomy, and liberty of association, but at the same time they were kept under strict rules and under the vow to obey officers nominated by the masters alone. Thus the dyers were not allowed to work on their own account, and were subject to heavy fines if the goods entrusted to them suffered the slightest damage; the rate of wages was fixed, but not the date of payment, which was invariably delayed.

On a lower tier came the weavers and the male and female spinners; both classes were isolated homeworkers under the system of domestic manufacture, which is highly unfavorable to combination and therefore to the independence of the workers. The weavers, whether proprietors or the lessees of their trade, could not set up without the permission of the masters who held the monopoly of wool, on whom they therefore became entirely dependent. They were pieceworkers and had no guaranteed schedule of prices.

The spinners lived for the most part in the country, and this country labour served as usual, to lower the rate of wages in the town; perhaps this was why the Florentine tradesmen favoured the abolition of serfdom, for the reason that its abolition took the peasants from the land and left them free, but without property, thus forcing them to hire themselves out, and so creating a reserve army for the needs of industry.

On a lower tier again we find the washers, beaters, and carders of wool, the fullers and the soapboilers who formed the lowest grade of the labouring classes a true industrial proletariat, — wage-earners already living under
the regime of modern manufacture. They were crowded together in large workshops, subjected to a rigorous discipline, compelled to come and go at the sound of the bell, paid at the will of the masters - and always in silver or copper, or in small coin which was often debased, - supervised by foremen, and placed under the authority of an external official who was a sort of industrial magistrate or policeman chosen by the consuls of the arts empowered to inflict fines, discharges and punishments, and even imprisonment and torture. In addition, as subjects of the guilds, (they) are absolutely forbidden to combine, to act in concert, to assemble together, or even to emigrate. They were the victims of an almost perfect system of slavery. (57, pp. 25-4.

The attitude toward, and determination of, wages under the systems of guilds in their simpler and basic form (generally in the 13th, 14th and 15th centuries) was largely predicated on the cost of living, and workmen were paid what amounted to a subsistence, plus. In the earliest forms we find the master craftsman performing functions of workman, supervisors, employer, merchant and shopkeeper. Since the guild organizations and their members were under strict control of detail regulations administered either from within their organization or by municipal officers, wages were determined by the appropriate governing body. J. M. Lambert (Two Thousand Years of Gild Life) explains how this process was followed in typical cases:

There is, however, another case of which many examples may be quoted from the 14th to the 18th centuries. Here there is no evidence of any antecedent organization of the trade itself. For the better government of the trade and the benefit of the town, the Mayor calls together
the chief craftsmen, and after consultation, gives them a body of rules, appoints officers, and constitutes them a society. The Fraternity of Cobblerwas alone in Hull in having its officers yearly appointed by the Mayor, and its fines for breach of rules given to the first informant; but in nearly all cases the half of the fines went to the Town's Chamber, and the other half to the stock of the Gild. The Bakers were to come weekly to the Mayor to receive the assise of bread; but in every case the crafts­men engaged, either expressly or by implication, to supply good workmanship and material and at reasonable rates.

It will thus be seen that the system, so long as it worked, was one of great completeness and evident advantage to all concerned. Not only municipally, as now, but industrially and socially, the organisation of the town was complete. The several subordinate estates of the trades were each supreme in their own spheres. Each had his place. Every article, from a 500 ton ship to a basket or a glove, every profession from that of a merchant to that of a dancing master, was under rule. Every member was answerable for the excellence of his work and for his honesty and behaviour. The completeness of the system is as remarkable as its antiquity...

Every craftsman had his fixed status, and with it came his liberties as well as his responsibilities. Were the elements of society and the conditions of industry perfectly fixed and stable, some such system would be in many respects the ideal of their organisation. Its duration in this country [i.e., England] for six centuries is a sufficient evidence of its utility. But when the organisation of society and the methods of industry change with an expansion as rapid and immense as they have done within the last century and a half, it is evident that the old system must break up.

No reference had been made to the mutual relations of capital and labor, or employers and employed. And this omission has been intention­al, for as a matter of fact the separation of the two classes into hostile camps has only a secondary place in the industrial records of the
English towns of this period; the great industrial change which followed after the Black Death in 1349, was indeed one which altered materially the position of the unfree craftsmen, but its effect is hardly visible in the organisation of the crafts. Generally speaking in this country [i.e., England] the journeyman simply had his place in the Craft Gild, and within its limits his position was on the whole a settled and fairly prosperous one. Every workman was, with a few exceptions, one who had served his seven years of apprenticeship to the trade. He was then duly enrolled and had a fixed position and a share of whatever work there was. There is nothing in any one of these ordinances which puts any difficulty in the way of an apprentice or a journeyman becoming a master and employer. (26, pp. 188-90)

Lambert (26) records the actual ordinances of a number of guilds dated from 1490 to 1714, the last being that of the Barber-Chirurgeons, and which showed activity and records as late as 1786. While the ordinances invariably dealt with such matters as limitations of the number of apprentices, transfer of journeymen from one master to another, hiring of strangers ("not free of the said Town and Company"), rights of "searchers" (inspectors who examined workmen, shops, tools and practices of all members), fines levied for violations, etc., no specific mention of actual wages is found, with one or two exceptions. Apprentices were paid no wages, but only room and board, plus in some cases an annual lump sum. Like-

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1 Weavers, Glovers, Brewers, Tailors, Joiners, Carpenters, Goldsmiths, Smiths, Pecterers, Plumbers, Glaziers, Painters, Cutlers, Musicians, Stationers, Bookbinders, Basketweavers, Bricklayers, Tilers, Wallers, Plasterers, Powers, Coopers, Bakers, Coblers, Cordwainers and Shoemakers, Innholders, Shipweights, Barber-Chirurgeons and Perukemakers.
wise masters received no wages in that they were the employers and received their income directly from the sale of their goods. However, in the case of construction work, master masons or carpenters were paid wages by the employer (contractor-owner), who also supplied the materials. The journeymen were the principal body of craftsmen who received wages. There were, of course, laborers, (frequently in the earlier days, serfs), who received wages.

Wages in England Prior to 1350. Reference is made to Chart Number 1 (see Appendix C) which is taken from Professor Thorold Roger's excellent work, *Six Centuries of Work and Wages* (39). The part of the curves up to 1350 represent the conditions prior to the Black Death, when labor was plentiful, but economic life was confined to agricultural areas and small towns, with little national or international trade. In spite of the utter crudeness of living conditions (by our present standards), Professor Rogers is convinced that the working people of those days were, in some important respects, "better off" in regard to the margin of income over cost of living, than working people of later times. An examination of Chart 1 (Appendix C) will indicate this margin.

The differentials in wages in this period (prior to 1350) then appears to be based on the following:

1. The particular craft or trade.
2. The status of the workman, whether apprentice, journeyman or master.
3. The quality (or the reputation for the quality) of work produced or performed by the workman.

4. The geographical locality, whether London or the country, for example, although this was to have greater bearing at later dates.

It must also be noted that certain controls began to appear with the emergence of towns and handicrafts. Some of the principal controls were on the price of wheat (bread), ale, and other staples or necessities (some of these controls remained in the hands of local authorities until as late as 1824), manufacturing methods and wages. The controls were accepted as the only way to balance cost of living and wages, insure maintenance of trade monopolies and thus the stability of the community. An important and basic point is that "as long as manufacture was organized on guild principles, labor was little regulated by the (national) government." (22, p. 215)

Thorold Rogers gives the following account of wage differentials in the 13th century:

Hence the wages of the artisan are generally reckoned by the day, more rarely by the piece, though where piece-work can be conveniently given, it is found. Thus the pair of sawyers are constantly paid by the day, but nearly as often by the hundred of boards, sawn; this quantity being about the amount an average pair of sawyers could turn out in a day's work. In the 13th century we find traces of a different quality in carpenter's labor, the best being paid at 3 1/2 d. a day, the ordinary at three pence. Artisans' wages are from twenty-four to sixty per cent. higher in London, where they reach four pence and five pence. A pair of sawyers will get seven pence a day together or
from seven pence to eight pence the hundred. Where labor is of special quality, or impressed, the rate rises in the country to four pence or even five pence. The master mason or master carpenter receives slightly higher wages, and sometimes in addition to his weekly earnings a yearly fee. (39, p. 43)

After the Black Death. Reference to Chart 1, Appendix C, reveals a period of approximately 150 years, from 1350 to 1500, of real prosperity for the workers. The Plague had killed more than one-third of the population, and the subsequent shortage of labor caused the demand to increase, and therefore wages also. This was in spite of the fact that the Statutes of Laborers, enacted in 1351–3, required all laborers to stay on the land and at the wages at which they had worked in 1346. The ultimate result was not only higher wages, but emancipation of land workers, and the creation of a class of hired laborers, and leaseholders (or freeholders) who worked the soil.

Another class was also rising out of this situation of better wages, declining power of urban guilds, expanding markets and breakdown of the manorial system. This was the "capitalist artisan" who supplied capital to promote certain industries (particularly the woolen cloth industry). This enabled the producers to manufacture to stock, rather than to a particular customer's order. This was the beginning of the new mercantilism, and marked the close of the Middle Ages and the beginning of the modern era.
As to actual wages in this period (15th century)

Rogers (39) gives a very graphic account, indicating the consideration given to the more skilled trades, and differentials between agricultural labor and artisans:

The wages of the artisan, during the period to which I refer, were generally, and through the year, about six pence a day. Those of the agricultural laborer were about four pence. I am referring to ordinary artisans and ordinary laborers. Persons who plied a craft in which greater skill was needed, perhaps one which was rarely procurable except from a distance, received more: Thus, the carpenter, taken generally, gets a little under six pence. He was constantly employed in agricultural operations and for domestic business. But the plumber, who might not be so regularly employed or was hired from a distance, gets 6 1/2 d., on an average. The mason, whose labor was likely to be suspended during winter time or in very bad weather, gets the full average. The joiner, who is employed in finer carpentry, is better paid than the average carpenter. It should be noted, too, that as the century goes on, the wages of labor tend decidedly upward. Nor is there any material difference, with one notable exception, in the payments made for labor all over England. It is equally well paid throughout the whole country. The exception is London, where the wages were from twenty-five to thirty per cent over the rates paid in other places. This increase may be due either to the cause that the guilds made labor in London comparatively scarce, or to the greater cost of living in London, for general prices are, as a rule, higher in or near the metropolis; or to the fact that the best craftsman sought London as a place of employment and were better paid, because worth more than elsewhere. (39; pp. 73-74)

Rogers goes on to state that the work day was one of eight hours, and that the same daily rate was paid whether a laborer worked one day or for a long period of time.
The general position of wage earners seems to have been that they were considered to be about equal as a class, or perhaps two classes: laborers and artisans. Thus the two lines on Chart 1, Appendix C, are fairly representative of the total wage picture, both as to absolute and relative values of workers.

V. BEGINNINGS OF THE MODERN ERA TO THE INDUSTRIAL REVOLUTION

Government Regulations. The economic conditions referred to above continued to exert additional influence on the status of the workers at the beginning of the 16th century. However, by the middle of that century Henry VIII had debased currency, confiscated the church's property and restricted the guilds. The real wages of workers dropped rapidly and consequently in 1562-3 the famous Statute of Apprentices (6 Eliz. c.3,4.) was passed. This repealed any and all laws pertaining to hiring, wages, etc., and set up regulations controlling hours (5 A.M. to 7 or 8 P.M. less two and one half hours for meals and rest during the period March through September, and from daylight to dark during the winter months); wages (determined by justices in session, approved by the Privy Council, and posted by Sheriffs); working conditions (e.g., everyone between 12 and 60 years of age, not elsewhere employed, could be compelled to work by
the year as agricultural laborers); apprentices, (had to be an apprentice for seven years); and other phases of work.

There were severe fines and penalties for violators. George Unwin (Industrial Organisation in the Sixteenth and Seventeenth Centuries (49)) relates one result of this Act of 1562-3 as follows:

The first clause of the statute following the preamble provided that servants in certain employments, amongst which were included the various branches of the cloth industry, should be hired by the year; at the command of the Lord Mayor therefore, the masters and wardens of the cloth workers called the whole company before them to inquire what wages they gave their journeymen, and what wages they thought meet to give in the future. It appeared from the statements of the masters that the rates then paid varied very considerably. Some journeymen received two shillings a week 'broken and whole'; other two shillings and sixpence a week; whilst of those paid by the year some received four pounds; some five, and some six. But now, the report concludes; 'in respect of the Act of Parliament lately provided, they have agreed to give every Journeyman for his wages by yere (five pounds) yf it shall please your Lordship and mastership to allow the same.' It is taken from the clothworker's courtbook June 9, 1565. (49, pp. 119-120).

Thus it appears that the masters, in conjunction with the local authorities, regulated wages, and tended to set one standard wage for all journeyman in a given craft. And as can be seen from Chart 1, (Appendix C) the trend was to lower the wages, not raise them.

Many of the provisions of this statute were subsequently strengthened, and not until the first quarter of the
nineteenth century was legislation passed repealing provisions of this Act of 1562-3, and recognizing rights of workingmen. In 1601 the so-called Poor Law was passed, which required community authorities to provide work for able-bodied paupers and pay them a minimum wage. Then in 1799-1800 a law was passed forbidding all combinations of journeymen. This law actually was a summary and culmination of a series of acts throughout the eighteenth century.

With growth of manufacturing and trade in the seventeenth and eighteenth centuries, and the restrictions on labor as indicated above, the workers gained a class consciousness. Strikes, revolts, and uprisings became more frequent. For example, Remard and Weulersse (Life and Work in Modern Europe (38)) cite a case: "In 1710 the London stocking-knitters went on strike, enraged because their masters profited by the use of a new loom to employ an excessive number of apprentices. They broke machinery which did not belong to them, and the use of which threatened to ruin them." (38, p. 95) Not only guild members, but the so-called "free" workers in the large industries, attempted organization and strikes to gain economic advantages. The number of acts passed to prevent such combinations is evidence of their strength and the concern they caused. It is evident that many violations of the numerous acts to suppress and control the workers were not successfully punished, although the general effect was to hold the laboring class in a very
abject and unequiable state. During this period, artisans were generally in a better position than laborers, as can be seen from Chart 1, Appendix C. The latter were kept, by legislation, at subsistence level, while the craftsman had some opportunities to make more than minimum rates. Also by the first part of the nineteenth century the guilds (as originally organized) had practically disappeared, and by 1850 there were a large number of trade unions of the form known today.

VI. JOSIAH TUCKER AND ADAM SMITH

Josiah Tucker. The transition into the period of the Industrial Revolution, (where this discussion leaves England to observe the wage structure situation in America) can be understood better by reference to two writers who were keen analysts of eighteenth century economics and production. It must be remembered that "industrialism" and "capitalism" were unknown in the forms recognized today. Mercantilism was the predominant economic system, and although Adam Smith envisioned the future, it was one of greater freedom, lassálle, and elimination of trade monopolies and government bounties and legislation in favor of the merchants and large manufacturers. Josiah Tucker\(^1\) preceded Adam Smith by nearly

\(^1\) Contemporary of Adam Smith who lived from 1713 to 1799, and wrote on economics, politics and religion. He was Rector of St. Stephen's Church in Bristol, England. His essays on manufacturing and labor were written circa 1758, some
20 years, and was an astute observer of economic and working conditions. His discussion (partly in question and answer form) of manufacturing, division of labor, industrial relations, wages, etc. is so incisive and vivid that it is reproduced in Appendix A in its entirety. He favors piece work as preventing loitering and calling forth "Industry, Dexterity, and Skill" on the part of the worker. Although mechanical inventions had begun to affect industry only during the eighteenth century, Tucker very accurately explains that such inventions do not work to the disadvantage of the workers, but reduce prices and create jobs by increasing demand and therefore consumption. In discussing division of labor and work performed by women and children, he points out that by using a child to assist in a certain stamping operation, "this single circumstance saves about 80 or near 100 per cent, at the same time that it trains up children to an habit of industry, almost as soon as they can speak." (41 p. 242) No social reformer, he! Tucker makes an enlightening comparison between the working conditions and attitudes in small versus large (1000 employees) manufacturing establishments. He points out that large numbers of workers in one shop tend to "corrupt each other, to rebel and associate against their Masters, and to break out into mobs and Riots upon every little occasion," and that they look upon their master "as years prior to Wealth of Nations, and are said to have influenced Smith. Excerpts from Tucker's writings appear in Appendix A.
their common Enemy." (41, p. 244). Josiah Tucker also was in opposition to laws regulating wages, questioning the feasibility of making allowances for (among other factors), "the Goodness or Badness of the Workmanship, the different degrees of Skill or Dispatch of the Workman," (41, p. 254) indicating a recognition of such variables and that wages should take cognizance of them. He felt that wages should be determined by mutual agreement between Master and Journeyman.

From the writings of Josiah Tucker it is evident that an awareness of the elemental problems and features of industrialization, then embryonic, was beginning to stir the minds of thinking people.

Adam Smith. Adam Smith also was a keen analyst and evolved an economic doctrine that was to influence the thinking of economists (Ricardo, Mill, et al) down to the present time. Again it is necessary to emphasize that Smith's environment was one of mercantilism, and Eli Ginsberg (The House of Adam Smith (18)) states that: "In Adam Smith's time production was organized on a small scale; owner and worker frequently labored side by side. Fixed capital was comparatively unimportant, and the majority of the workers owned their tools. Frequently one could engage in both agriculture and manufacturing; the cottage laborer worked his farm at one
season and his loom at another." (19, p. 171) At the beginning of the eighteenth century crafts were essentially the same as they had been for centuries. The carpenter or weaver of Ancient Greece could have taken up his trade in 1700 with little difficulty, yet: "At the beginning of the nineteenth century things had changed, and within the next few years continued to do so even more rapidly; the points of contact with the past grew increasingly indistinct. The pecuniary and the industrial phases of modern capitalism became sharply differentiated, for the manufacturers lost almost all interest in the productive process; money profits were now their major concern. At this time the modern factory developed. The city slums expanded because the industrial establishments employed large numbers of people. Cottage laborers were either forced to leave the land because of the inclosures, or else were enticed by high money wages to seek work in the cities. In any case, the domestic laborers would soon have been forced to give up the ghost because they could not long have competed with the new machines. A large part of the working population found itself in congested cities without a single possession in the world except its labor power."

(19, p. 171-2) Nevertheless, Adam Smith realized the importance and role of labor in production and began his classic as follows: "The greatest improvement in the productive powers of Labour, and the greater skill, dexterity, and
judgment with which it is anywhere directed, or applied, seem to have been the effects of the division of labour." (43, p.5)

He then presents his pin manufacturing example to illustrate division of labor. In his analysis he also mentions, somewhat sketchily, other factors which contribute to improving the "productive powers of labor," such as technological developments in machinery and other types of developments in connection with health and well-being. Nevertheless, division of labor (according to Smith) is the fundamental principle, and might be said to be a contributor to many other developments related to increased productivity.

The preception that Adam Smith had, not only of the economic value and nature of labor, but of the relative value of different types of work, is clearly evident when he states:

But though labour be the real measure of the exchangeable value of all commodities, it is not by which their value is commonly estimated. It is often difficult to ascertain the proportion between two different quantities of labour. The time spent in two different sorts of work will not always alone determine this proportion. The different degrees of hardship endured, and of ingenuity exercised, must likewise be taken into account. There may be more labour in an hour's hard work than in two hours' easy business; or in an hour's application to a trade which it cost ten years' labour to learn, than in a month's industry at an ordinary and obvious employment. But it is not easy to find any accurate measure either of hardship or ingenuity. In exchanging indeed the different productions of different sorts of labour for one another; some allowance is commonly made for both. It is adjusted, however, not by any accurate measure, but by the higgling and the bargaining of the market, according to that sort of rough equality which, though not exact,
is yet sufficient for carrying on the business of common life. (43, p.p. 31-2)

If one species of labour should be more severe than the other, some allowance will naturally be made for this superior hardship; and the produce of one hour's labour in the one way may frequently exchange for that of two hours' labour in the other.

Of if the one species of labour requires an uncommon degree of dexterity and ingenuity, the esteem which men have for such talents, will naturally give a value to their produce, superior to what would be due to the time employed about it. Such talents can seldom be acquired but in consequence of long application, and the superior value of their produce may frequently be no more than a reasonable compensation for the time and labour which must be spent in acquiring them. In the advanced state of society, allowances of this kind, for superior hardship and superior skill, are commonly made in the wages of labour; and something of the same kind must probably have taken place in its earliest and rudest period. (43, pp. 42-3)

The comparison between Adam Smith's terms used to differentiate varying values of work and those used in many present day Job Evaluation systems is obvious and illuminating. Such ideas as "ingenuity," "hardship," (now classed as "working conditions: hazards, disagreeable conditions"), "physical effort," "skill," "dexterity," "judgment," and, specifically, time to learn and experience, approach a rather complete listing of factors now used to evaluate jobs. Although the factors were recognized by Smith, (and he even seems to imply, wishfully, as it were, that such could be
subject to "accurate measure"), in actual business life, wages were determined by individual bargaining in the market.

Another function of a manufacturing organization was recognized and evaluated by Adam Smith, was that of supervision and management. He discusses this function in connection with responsibility for stock and profits in the following manner:

The profits of stock, it may perhaps be thought, are only a different name for the wages of particular sort of labour, the labour of inspection and direction. They are, however, altogether different, are regulated by quite different principles, and bear no proportion to the quantity, the hardships, or the ingenuity of this supposed labour of inspection and direction. They are regulated altogether by the value of the stock employed, and are greater or smaller in proportion to the extent of this stock. Let us suppose, for example, that in some particular place, where the common annual profits of manufacturing stock are ten per cent, there are two different manufactories, in each of which twenty workmen are employed at the rate of fifteen pounds a year each, or at the expense of three hundred a year in each manufactory. Let us suppose too, that the coarse materials annually wrought up in the one cost only seven hundred pounds, while the finer materials in the other cost seven thousand. The capital annually employed in the one will in this case amount only to one thousand pounds; whereas that employed in the other will amount to seven thousand three hundred pounds. At the rate of ten per cent, therefore, the undertaker of the one will expect a yearly profit of about one hundred pounds only; while that of the other will expect about seven hundred and thirty pounds. But though their profits are so very different, their labour of inspection and direction may be either altogether or very nearly the same. In many great works, almost the whole labour of this kind is committed to some principal clerk. His wages properly express the
The increase in the wages of labour necessarily increases the price of many commodities, by increasing that part of its which resolves itself into wages, and so far tends to diminish their consumption both at home and abroad. The same cause, however, which raises the wages of labour, the increase of stock, tends to increase its productive powers, and to make a smaller quantity of labour produce a greater quantity of work. The owner of the stock which employs a great number of labourers, necessarily endeavors, for its own advantage, to make such a proper division and distribution of employment, that they may be enabled to produce the greatest quantity of work possible. For the same reason he endeavours to supply them with the best machinery which either he or they can think of. What takes place among
the labourers in a particular workhouse takes place, for the same reason, among those of a great society. The greater their number the more they naturally divide themselves into different classes and subdivisions of employment. more heads are occupied in inventing the most proper machinery for executing work of each, and it is, therefore, more likely to be invented. There are many commodities, therefore, which, in consequence of these improvements, come to be produced by so much less labour than before, that the increase of its price is more than compensated by the diminution of its quantity. (45, pp. 84-5)

The interest shown here in Adam Smith is not primarily for his economic theories, but for his lucid analysis, albeit a qualitative one, of the underlying factors of wages. The above brief quotations reveal only one phase of his analysis. It is remarkable that nearly 150 years of the Industrial Revolution elapsed before an attempt was made to assess quantitatively the factors referred to by Smith as not being easy to measure accurately, but continued to be adjusted almost entirely by the "haggling and the bargaining of the market." As will be discussed later on, the market has a part in determining wage differentials, but Job Evaluation, per se, minimizes such external effects.

By this stage in the historical development of wages, the colonies in America, (and subsequently, of course, the United States of America) began to show signs of independent trends and evolution. England, finally, by 1824, threw off most of the medieval restrictions on wages and labor; trades unions developed; and eventually, the Labour Party was to
gain political control of the country.

VII. ECONOMIC AND SOCIAL BACKGROUND OF WAGES IN THE UNITED STATES

A brief summary of the stages in the economic development of the American industry will highlight the conditions under which wage differentials existed. The periods can be divided as follows:

1. Colonial and Revolutionary period - approximately 1650-1789
2. Economic transition - 1790 - 1815
3. Westward expansion - 1816 - 1860
4. Industrial expansion - 1861 - 1919
5. Between wars development - 1920 - 1940
6. World War II to date - 1940 - 1954

Colonial and Revolutionary Period (1650-1790). During the first period (Colonial and Revolutionary), the majority of manufactured products were imported, with a few notable exceptions, such as ships. The type of manufacturing was principally handicraft, with the traditional apprentice - journeyman - master arrangement. Much work, such as shoemaking, textile manufacturing, etc., was performed in homes, and very little in the way of machinery existed. However,

\[\text{The material on this subject is chiefly from Wright, C. W., Economic History of the United States. (58), except where noted.}\]
toward the latter part of the period, the production of (e.g.) pig iron, increased to the point where a total of 82 blast furnaces and 175 forges were in operation, turning out a total of about 50,000 tons in 1775.

Although, as mentioned above, the typical guild arrangement of apprentice - journeyman - master was common, the actual incorporation of guilds was limited to two such in Boston in 1648.1 Skilled labor was scarce, because of the restrictions on such labor emigrating from Europe, England especially, and because farm land was available to those who wanted to establish an independent life for themselves. Consequently wages in the Colonies were higher than in England, approximately 25% for common laborers and 50% for skilled artisans. These factors, plus the rather extensive use of slaves and indentured servants, especially in the southern colonies,2 resulted in the rather slow development of industry in this period. Those skilled workers who followed trades of shoemaking, shipbuilding, tanning, textile manufacturing, etc., were frequently all-round craftsmen, not specialists in one phase of the work. In other words, division of labor had not become a real factor in manufacturing. As to money

1 "The Company of Shoemakers" Boston, 1658, and "The Company of Cooperers," same date. Their charter granted by the Colony of the Massachusetts Bay, closely follows the form and wording of English guilds' charters. (12, pp. 20-22)

2 Wright (58) estimates that by 1776, 465,000 of the half-million slaves were in the southern colonies.
wages paid, Wright (58, p. 119) indicates that adequate records are not available, but that probably toward the close of the period, common labor received 50 to 50 cents per day and skilled workers $.60 to $1.25 per day. Many craftsmen were reimbursed by the piece, and being in a close relationship to the market, the selling price was frequently a direct determinant of wages. There was also very little restriction by any governing authorities on wages, exceptions being in the early days when Massachusetts (1634, 1636) passed ordinances similar to English laws of the time. One such was to limit the wages of construction workers to two shillings per day, and to grant towns authority to fix maximum wages within their borders. More common, however, was the English custom of regulating prices, particularly of such items as bread. This had the substantial effect of regulating wages.

A case in connection with shoemaking is discussed below regarding piece-work rates in the second period (1790-1815). The circumstances revealed therein were probably extant in the first period also.

The Revolutionary War and the following reaction under the Confederation was of course a period of inflation and then depression, confusion and change, great demand for goods and subsequently, over-supply. Since this phase of the first period is unique in many ways, it will serve our purpose more
adequately to investigate the wage differential picture of
the second period (1790-1815). The period of economic transi-
tion is one in which the country steadied itself after the
rough seas of the Revolution and Confederation. The economic
order of 1815 was greatly advanced over that of 1775. The
foundations for the tremendous growth and development of
this country were being laid, yet many old ideas still fought
for existence against the newer concepts of individual free-
dom and equality of opportunity. Some of this aspect is
revealed in the wage problems of the era.

**Economic Transition (1790-1815).** The beginnings of
wider markets is important as the leading factor in develop-
ing industry, and the period showed signs of such. For
example the population nearly doubled (from 4,000,000 in 1790),
canals and roads were started and expanded, and manufacturing
was stimulated (after only moderate growth since the close of
the Revolution) by the Government's Embargo Acts which rather
effectively cut off foreign commerce. In 1810 the total
value of manufactured products was almost $200 million dol-
lars. Cotton mills and cotton gins were set into operation
and the beginnings of industry were at hand.

Organizations of craftsmen (journeymen) began to ap-
pear more frequently during this period. For example the
"first recorded instance of a workers' organization in Ohio
was the Dayton Mechanics' Society, founded in 1818."¹

There is available the complete court transcription of two cases which shed light on the wage problems of this period. The reference for these cases is the Documentary History of American Industrial Society, edited by John R. Commons and Eugene A. Gilmore, (12) and contains "The Trial of the Boot and Shoemakers of Philadelphia, on an Indictment for a Combination and conspiracy to Raise their Wages - 1806." The defendants were a group of journeymen shoemakers known as the Philadelphia Cordwainers, who originally had been organized about 1790, and reorganized in 1798, for the purpose of obtaining increased wages. The trial was based on the proposition that such organizations and the actions they took (strikes, enforcing union shops, etc.) to raise wages was a conspiracy. This case and a similar one in New York (1809) are therefore known as "Labor Conspiracy Cases." Although the defendants in both cases were found guilty, the fines were light (eight dollars and cost for each defendant in Philadelphia and one dollar and costs in New York) and the court indicated the verdict was more of an admonishment than a punishment.

The chief point of interest in these cases in connection with an analysis of wage differentials is the methods by

¹ Columbus, Ohio, Dispatch, September 7, 1955.
which such differentials were determined. In the first place, all compensation to journeymen cordwainers was on the basis of piece rates. (Journeymen usually received their material and orders from the master, or shop owner, and performed the work in their homes. One master might "employ" as many as twenty journeymen.) The style of boots was a determinant of prices paid for boots. For example, the following schedule was entered into the court record (12, p. 106) as wages paid to journeymen in 1805:

- Fancy tops were $4.25 proposed to be raised to $5
- Back straps = 3.75 to be raised to 4
- Long boots = 2.75 to be raised to 3
- Cossack = 2.75 to be raised to 3
- Bootees = 2.50 to be raised to 3

There was considerable difference of opinion regarding the weekly earnings that could be realized under the first schedule shown. Quotations from the testimony of the case will illustrate this point. Lewis Ryan, a master, being sworn, was asked:

Q. How much can a smart journeyman earn in a week?
A. I have had them to earn but $6.00 and $7.00 but some have earned $11.25, and $12.00 a week; a good workman may earn $11.25 per week, for a good workman can make three pairs of back-strap boots a week which at $3.75 per pair is $11.25. (12, p. 106)

Later during the same trial Mr. John Hayes, during cross examination, was questioned as follows:

---

1 Dollar and cents figures were spelled out in original document.
Q. Do you work for Ryan?
A. I did before and during the fever but he deducted $0.25 a pair for the boots I made while the fever lasted.

Q. What did you earn a week of Mr. Ryan?
A. I work very hard, and later hours than other men, at most I can earn but $10.00 a week; I don't remember ever earned $11.25; in common I could not earn more than $7.00 or $8.00; on an average I cannot make more than $9.00.

Q. Did Muir earn more than you?
A. I believe he did but he had to work on Sundays to do it. (12, p. 125)

Average wages for skilled artisans amounted to $8 to $9 per week (58, p. 408).

The prices (wages in the first column above (page 62)) were an increase over prices that had been in existence some eight to twelve years before. For example, in 1790-1, journeyman's wages were $1.40 for cossack or long boots, and by 1805 this price had risen to $2.75, as shown above. (12, p. 49)

As a matter of fact, the $2.75 figure was achieved by 1796, and remained constant (except for the time of the cholera epidemic - the "fever" - in 1798) until 1805 when another reduction to $2.50 precipitated the strike leading up to the case and trial referred to above.

Another important consideration was the fact that different wages were paid for work going to different markets.

The four types (as of 1806) are described by Commons and Gilmore (12, p. 31) in their Introduction as follows:

At that time we find the journeyman engaged on one kind and quality of work, with the same tools.

---

1 Dollar and cents figures were spelled out in original document.
and workshops, but with four different destinations for his product. Each destination was a different market with a different level of competition, leading ultimately after a struggle, to differences and quality of product. The terms employed at the time recapitulate the evolution of the industry. 'Bespoke-work' recalls the primitive custom market of the Boston Guild, now differentiated as the market offered by the well-to-do for the highest quality of work at the highest level of competition. 'Shop work' indicates the retail market of less particular customers at a wider but lower level of competition and quality. 'Order work' indicates a wholesale market made possible by improved means of transportation but on a lower level of strenuous competition and in different quality projected from other centers of manufacture. 'Market work'—i.e., cheap work sold in the public market—indicates the poorest class of customers and consequently the lowest level of competition, undermining especially the shop-work level, and, to a lesser degree, the order work level, but scarcely touching the bespoke level. (12, pp. 30-1)

As an example, there was a twenty-five cent differential between "bespoke" and "order" work, but the wholesale price was subject to individual negotiation, and frequently was about twenty-five cents under the "order" work. Shop work appears to have been comparable to bespoke work. This development led to the superior workmen concentrating on bespoke and shop work and the poorer workmen on the wholesale and order work resulting in variations in the quality of shoes and boots.

One of the contentions of the journeyman's society was "equal pay for equal work." The master's felt that, partially at least, that: "A different price will be given to different workmen; some deserve more than others, either on
account of their greater industry and application, or their greater skill and ingenuity." (12, p. 145) The masters, of course, wanted the final say in setting wages; and in many instances they were fair (according to the workmen) to their employees.

A difficulty which was arising, and continues in more complex forms today, was that the styles, materials, design, methods, etc., were changing from time to time, and at an accelerating rate. Thus, whereas, a back-strap boot had been understood to mean a particular style, with certain trim, stitching, etc., now, additional items (special linings, different tops and the like) required more time and skill. Certain of these items were compensated for by additional payments, but one of the chief points of dispute centered around the fact that the journeymen could not earn as much on the more expensive boots as on the cheaper ones. This was because of added features in the fancy top and back-strap boots. Some journeymen refused to work on such boots, claiming they could not earn subsistence wages thereby.

The second Conspiracy Case (New York Cordwainers, 1809), was similar to the Philadelphia case, in that the society of cordwainers was indicted for conspiring to raise wages. The pertinent data regarding wage differentials was introduced as evidence, and has been included in Appendix D as Table XV.

This listing indicates that work of varying degrees of
difficulty and quality was recognized and paid for. With two exceptions, the intervals were in units of twenty-five cents. If this was a conscious grouping, it would seem to demonstrate that finer divisions were not practicable and could not be defended on a logical basis.

Westward Expansion (1816-1860). Once the Industrial Revolution overcame its initial inertia in this country, developments came rapidly. Railroads and river steamboats probably contributed as much as any phase of industrial activity, not only to the westward movement, but to manufacturing itself. Another important industry was the textile industry. According to Wright, (58, p. 387) "the first modern factory in America" (a cotton mill) was established in Waltham, Massachusetts in 1814, and by 1934 one town (Lowell, Mass.) had 19 cotton mills. Both water and steam power were used in these early factories, and a well integrated system of manufacturing was brought into existence. However, up to 1860 much of the weaving, etc., still was accomplished on hand equipment either in homes or small shops. The production of iron and other metals increased, particularly after 1840, and by 1860 several large firms had more than $1,000,000 each invested in furnaces and other equipment. The per capita used of iron around 1800 was five pounds, while by 1860 it was 120 pounds. There were 1,200,000 people employed in manufacturing (25% being women) in 1860,
and the gross value of products was $1,800,000,000. The scene had changed, during this period, from one dominated by village artisans to city manufacturers.

The above developments were accompanied by fundamental movements in division of labor, more specialization of jobs and crafts, "transfer of skill," grouping of large numbers of workers together, use of more unskilled and semi-skilled workers, increased educational opportunities, and the real awakening of the American labor movement. Thus, it is evident that in this period the American industrial system had its beginning. The start was not without its difficulties and troubles. A severe depression occurred in 1837-39, from which full recovery was not made until 1843. While a general picture of prosperity can be painted, many workers suffered from the introduction of new machinery, long hours, reduced wages and poor working conditions.

In this period also is evidenced the growing attitude of the owners of factories (capital) in regard to labor. Dr. Norman Ware in his excellent critical analysis, The Industrial Worker, 1840-1860 (56, pp. 7-8) presents the following tabulation of wages, dividends, production, etc. for eleven Lowell, Mass. cotton mills:
# TABLE I


<table>
<thead>
<tr>
<th>Item</th>
<th>1844</th>
<th>1945</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital</td>
<td>$10,500,000</td>
<td>$11,000,000</td>
</tr>
<tr>
<td>Number of spindles</td>
<td>192,376</td>
<td>204,000</td>
</tr>
<tr>
<td>Number of females employed</td>
<td>7,430</td>
<td>7,000</td>
</tr>
<tr>
<td>Wages per week</td>
<td>$2.00</td>
<td>$1.75</td>
</tr>
<tr>
<td>Yards of Cloth per week</td>
<td>1,435,450</td>
<td>1,500,000</td>
</tr>
<tr>
<td>Dividends</td>
<td>4 1/2%</td>
<td>12 1/2%</td>
</tr>
</tbody>
</table>

This sample indicates that the factory owners were in control of the situation and were able to increase their profits by means of machine production and lowering of wages. Several factors kept wages depressed, although there was a slight general trend upward in both real and money wages. In certain industries, which were becoming mechanized, such as textile, iron, needle trades, printing, hat-making, and which also utilized piece work as a basis of payment, earnings of all grades of workers showed sharp fluctuations. Ware (56, p. 119) presents an example from a Massachusetts cotton mill:

# TABLE II

Wages Paid in a Massachusetts Cotton Mill, 1843-1860

(Establishment No. 39 - Weekly Wages)

<table>
<thead>
<tr>
<th>Year</th>
<th>Spinners</th>
<th>Weavers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1843</td>
<td>$2.75</td>
<td>$3.66</td>
</tr>
<tr>
<td>1845</td>
<td>2.64</td>
<td>2.67</td>
</tr>
<tr>
<td>1850</td>
<td>2.61</td>
<td>2.58</td>
</tr>
<tr>
<td>1855</td>
<td>2.55</td>
<td>2.76</td>
</tr>
<tr>
<td>1860</td>
<td>2.85</td>
<td>2.76</td>
</tr>
</tbody>
</table>

1 From Ware, Norman, The Industrial Worker, 1840-1860, (56, pp. 7-8)
2 Ibid., p. 119.
The dollar wages are weighted averages, and illustrates the tendency of the wages of two different jobs to seek a common level under what amounted to a system of "laissez faire".

The following schedule (Table III) shows wages in the iron industry (Pittsburgh) in dollars per ton, and weekly earnings:

### TABLE III

<table>
<thead>
<tr>
<th>Job</th>
<th>Rates (1850)</th>
<th>Average Earnings per Wk.</th>
<th>Rank2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before After</td>
<td>Before After</td>
<td></td>
</tr>
<tr>
<td>Puddler</td>
<td>4.00 3.50</td>
<td>16.225 13.335</td>
<td>5 5</td>
</tr>
<tr>
<td>Helper</td>
<td>-- 4.00</td>
<td>6.875 6.875</td>
<td>6 6</td>
</tr>
<tr>
<td>Boiler</td>
<td>6.00 4.50</td>
<td>20.675 13.405</td>
<td>4 4</td>
</tr>
<tr>
<td>Helper</td>
<td>-- 1.00</td>
<td>8.250 8.250</td>
<td>4 4</td>
</tr>
<tr>
<td>Refiner</td>
<td>1.00 4.00</td>
<td>28.125 21.125</td>
<td>1 1</td>
</tr>
<tr>
<td>Helper</td>
<td>-- 6.00</td>
<td>6.875 6.875</td>
<td>1 1</td>
</tr>
<tr>
<td>Scraper</td>
<td>5.75 3.50</td>
<td>28.500 16.000</td>
<td>2 2</td>
</tr>
<tr>
<td>Helper</td>
<td>-- 9.00</td>
<td>9.000 9.000</td>
<td>3 3</td>
</tr>
<tr>
<td>Heater</td>
<td>1.375 1.00</td>
<td>24.000 15.000</td>
<td>3 3</td>
</tr>
<tr>
<td>Helper</td>
<td>-- 9.000</td>
<td>9.000 9.000</td>
<td></td>
</tr>
</tbody>
</table>

When it is realized that $12 to $15 per week was near the top average for skilled workers, and $6 to $8 for common labor, during this period, it can be seen that even the proposed wage schedule was not "out of line." The rates per ton had gradually come down, but this was apparently offset by

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1 Taken from Ware, Norman, *The Industrial Worker 1840-1860* (56, pp. 28-9); the "Before" was the existing schedule, the "After," a schedule proposed by the company to reduce wages. A strike ensued over the issue.

2 These columns under "Rank" added to original data to show change in average earnings per week. No change in Helpers.
increased productivity, although Dr. Ware does not specifically mention this. The very high "before" rates, indicates that such must have been the case. Also it is noted that the ranks of the "Refiner" and "Scraper" were reversed in the two schedules. About this same time shoemakers, hatters, printers, and other related craftsmen were earning $4 to $6 per week, while skilled construction workers were receiving between $10 and $11. The average earnings of women in the needle trades in New York in 1845 were $1.50 to $2.00 per week.

Unions were non-existent or poorly organized in this period; immigrants came by the thousands to accept work at wages lower than "native" workers; and individual bargaining predominated with its basis of supply and demand. All these were factors that kept both real and money wages low, and also presented a confused picture regarding differentials between jobs and classes of workers. As a general statement it can be said that "wages of the more skilled artisans and mechanics in the large cities were nearly double those received by common laborers." (58, p. 409)

Ware takes an excerpt from the records of the State of Massachusetts\(^1\) to illustrate the attitude of at least one manager of a cotton mill in Fall River regarding the welfare of his workers:

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\(^1\) Massachusetts Senate Doc. Number 21, 1868, p. 23.
A quotation from the Massachusetts Senate No. 21 dated 1868, page 23 quotes one of the agents of a principal factory in Fall River, Massachusetts as follows: 'As for myself, I regard my work people just as I regard my machinery. So long as they can do my work for what I choose to pay them I keep getting out of them all I can. What they do or how they fare outside my walls I don't know, or do I consider it my business to know. They must look out for themselves as I do for myself. When my machines get old and useless, I reject them and get new, and these people are part of my machinery. (56, p. 77)

If a conclusion might be reached regarding this period, it is that both managers (owners, capitalists—merchants) and workers were faced with new forces they did not fully understand. The old crafts-guild arrangement (or its equivalent) no longer existed, markets were expanding and machine production was becoming important. The spirit of laissez faire influenced relations between managers and workers, and apparently only a crude conception of the relative worth of jobs existed in the minds of both.

Industrial Expansion (1861-1919). The six decades in this era constitute one of the most remarkable in any nation's history. Economically the country rapidly transformed itself from one predominantly agricultural to one industrial. Although the limits set for this period are somewhat arbitrary, the end points include two major wars and present convenient boundary lines to discuss the developments represented therein. Unquestionably the Civil War greatly stimulated industry, and the largest relative growth in manufacturing occurred during the seventies and eighties (except for the abnormal
war periods themselves). Value added by manufacture, for example, was $854 million in 1859, and nearly $25,000 million in 1919 (current values), and the number of wage earners increased from 1.3 million to 9.1 million (58, p. 707-8). These figures indicate an over-all increase in productivity of nearly 320% (based on current values) per wage earner, which emphasizes technological developments, changes in organization and methods, increase in size of producing units and other phenomena of capitalistic industrialism.

Wright (58, pp. 732-3) presents some general, over-all statistics pertaining to typical, relative, real money wages and hours workers and are shown in Table IV below:

**TABLE IV**

Weekly Money Wages and Hours, 1860-1920

<table>
<thead>
<tr>
<th>Year</th>
<th>Dollars per Week</th>
<th>Common Labor</th>
<th>Artisans, Mechanics</th>
<th>Hours/Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1860</td>
<td>$ 6.00</td>
<td>$ 10.00 - 12.00</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>1880</td>
<td>7.50</td>
<td>15.00</td>
<td>58-60</td>
<td></td>
</tr>
<tr>
<td>1900</td>
<td>9.50</td>
<td>19.50</td>
<td>58-60</td>
<td></td>
</tr>
<tr>
<td>1915</td>
<td>12.00</td>
<td>24.00</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>1920</td>
<td>27.00</td>
<td>43.00</td>
<td>48</td>
<td></td>
</tr>
</tbody>
</table>

**Labor Unions and Scientific Management.** Two significant outgrowths of this period were (1) labor unions, and (2) what is called "scientific management." After the Civil War...

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1 From Wright, C. W., *Economic History of the United States* (58, pp. 732-3). Also see Chart Number 2, Appendix C.
the trade union movement was fairly active until about 1873, with 26 national unions and 300,000 members. The principal activity of these unions was directed toward securing the eight-hour day. The chief result was enactment by Congress of an eight-hour law for government employees in 1868.

An extended depression starting in 1873 reduced the union movement to a small fraction of its previous strength. However, in the eighties two unions vied for power in representing labor. These were the Knights of Labor, organized in 1869, but making little progress until after 1878, and the American Federation of Labor, founded in 1886 as a reorganization of the Federation of Organized Trades and Labor Unions (Samuel Gompers). The A.F. of L. was based on the craft union principle, whereas the Knights of Labor cut across craft lines and included semi-skilled and unskilled laborers.

The movement known as "scientific management," initiated around the turn of the century under the auspices of a group of engineers led by Frederick W. Taylor, purported to apply "scientific" principles to the problems of industry. The main point of attack was on systematizing the work in factories and increasing the output of the workers. The rapid growth of manufacturing, the continued development of machine tools, the increased size of factories, presented situations that could not be solved by handicraft and small workshop
methods and experience. "Scientific management" attempts to substitute ... exact knowledge for guesswork and seeks to establish a code of natural laws equally binding upon employers and workmen." (F. W. Taylor (24, pp. 8-9)) The issue of wages was attacked on the basis of establishing accurate standard times for each operation, and paying a bonus or premium for performance above standard. However, the base rate for a given class of work (e.g., drill press operator, floor sweeper, etc.) was still settled for the most part by individual "higgling and bargaining of the market."

The thorough and critical survey reported by Hoxie, (Scientific Management and Labor, (24)) reveals that no attempt was made by "scientific managers" to deal with the base wage problem on a systematic basis. Taylor's claims regarding wages, briefly, are that his system "raises wages," and that the individual worker is remunerated "according to his efficiency," rather than being paid by position. Little cognizance is given to the fundamental difference between base rates, and the additional premium earnings due to increased efficiency. The first (base rate) is the hourly, or day, rate associated with a given job, position or group of workers performing essentially the same operation. It may also refer to piece rates as in the traditional piece work industries such as clothing, boot and shoe, and the like.

The second fundamental element of the wage, then, under
an incentive or premium system, is the extra payment over and above the base rate. Each part of the total requires a different method of determination. Hoxie describes the approach and philosophy, relative to base rate determination, prevalent in the period just prior to World War I, not only of "scientific managers," but also industry in general, as follows:

If it is to be scientific and just according to our commonly accepted standards of judgment, it must be exactly equal to the value of the product created thus by the worker, or it must reward all workers in exact proportion to the skill and energy which they expend. View in this light, one will seek in vain for any scientific methods devised or employed by scientific management for the determination of the base rate. Close questioning brought out no pregnant suggestion as to how the relative claims of capital and labor might be justly determined. It was claimed by some that the relative skill and energy employed in closely allied trades could be determined by comparative elementary analysis of the movements involved. But those who held to this view were forced to admit that where skill is a vital factor this method breaks down, that there is no scientific mode of comparison between different trades where the expenditure of effort differs qualitatively. As a matter of fact, the problem here presented would seem to be altogether new and strange to the majority of scientific managers, and by the best of them it is only vaguely comprehended. Most of those who are aware of it at all are possessed of a vague faith that in some mysterious way competition, unhampered by the 'unnatural' efforts of labor unions, works out a just adjustment of absolute and relative base rates. That is to say, scientific management in this connection accepts consciously or unconsciously an abandoned theory of economics as a common sense proposition, and practically on this basis rears its claims to scientific accuracy and justice in the establish-
ment of wage levels. The point may seem over-emphasized until it is remembered that inaccuracy and injustice in the base rate invalidate the claims to accuracy and justice based on the modes of payment employed. For efficiency rewards are reckoned in terms of the base rate. In justice, however, to the better-informed class of scientific managers, it must be said that no support is given by them to the Taylor claims in this regard.

When it comes to the actual setting of base rates, practically no consideration is given to any theory of scientific accuracy and justice. The rates are fixed almost universally with reference to the prevailing wage levels of the region. Generally, so far as the writer could discover, the attempt is to conform to the current rate. In several cases, higher rates were set with the avowed purpose of attracting the better workman. Instances were not wanting, however, where minima had been established considerably above the normal for the region because of a feeling that prevailing rates were disgracefully low, and of a desire to raise them generally. Cases exist of attempts to lower the union scale and, as it will be seen later, scientific management methods per se, have a tendency to shift workers into lower-paid grades, and perhaps to lower many of the ratings. Where current rates for the particular job are lacking, that is, where scientific management through time study analysis creates new tasks, the new base rates seem to be determined partly by analogy and partly by the competitive wage that can be commanded by the class of workers who are to perform the new tasks.

A significant fact in connection with the scientific management claim of justice in rate making is that the rates for women relative to those of men have, in general, not been altered in such shops. This matter was raised on several occasions with scientific management employers without arousing any apparent sense of injustice. Indeed, the writer was informed by one very influential leader that in this connection 'there is to be no nonsense about scientific management,' 'If by better organization and administration, what is now regarded as man's work can be done by women, women will be employed, and women's wages will be paid.' (24, pp. 63-4.)
The trade unions position at that time in regard to base rates was that "The basic wage of 'scientific management' is simply the customary wage of the region for the class of labor employed. It has absolutely no foundation in science or justice, but is the outcome of the relative competitive strength of workers and employers, and is often estimated at the bare subsistence level or even below."

(24, pp. 175-6) Collective bargaining was beginning to spread at the turn of the century in certain industries such as mining, printing and the building trades. Both unions and employer's associations were gaining strength, and the unions included as a principal objective the negotiation by collective bargaining of base wage rates. Their attitude was that "scientific management" precluded such negotiation, and they were opposed to it on that (and many another) count.

An excellent example of actual wage rates prevailing and paid in the first decade of this century is found in Colonel Babcock's, The Taylor System in Franklin Management (2), and the schedule is reproduced in Appendix D hereto as Table XVI. In explaining the determination of base rates, the going rate of 1905 was the basic figure, to which, periodically, was added a cost of living allowance, plus longevity and also ability to perform extra processes. The underlying thought regarding these base rates is expressed in Babcock (in 1917) as follows:
The fundamental base rates have been temporarily taken as the prevailing wage rate for men who worked by the hour without task in the year 1905. Careful study of a long period of years through our records show relatively less turn-over of labor in that year than in any other for a very considerable time before or since.

Wage increases were relatively frequent and uniform for the years 1904-5-6. Altogether it seemed to be a period when the working community was in good condition and the workers were able to obtain satisfactory wage rates without difficulty. No attempt has been made as yet to determine the correct wage rate for the workers or in any way to establish fundamental values for their efforts, but this fact has been established, if the base wage rates of 1905 were then equitable, our base wage rates are now equitable. Then, workers received no premium or extra recompense. It was a period during which, however, it seems that the workers received a fair and adequate wage for their industry. Since the base wage rate of today is the wage rate of 1905, with full allowance for the increase in living cost in this district, with an increase for years of continued service, and with increase for acquiring a knowledge of extra processes, their base wage rate is now proportionally greater than in 1905. (2, pp. 88-9)

Thus it is evident that, to the close of the period being discussed, there was no attempt of any consequence to systematically determine base rates, especially for factory jobs. There had been work done in another area, that is, office and clerical jobs, under the name "job analysis" as early as 1909.1 This field developed under the impetus of the new profession of personnel administration, and was distinct from the type of activity dealt in by industrial engineers.

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1 E. O. Griffenhagen's pioneering work with the Commonwealth-Edison Co., Chicago.
World War I gave considerable stimulus to personnel administration and thus to job analysis. But job analysis' purpose was to determine job characteristics (in terms of psychological concepts) and then relate personal and physical qualities of workers to the characteristics in order to obtain optimum performance. Basically, job analysis is not directly concerned with establishment of base rates, but it was the first attempt to apply the principles of a science (psychology) to an understanding of the nature of jobs and the people who perform the work. As has been shown, thinking people for centuries had vaguely, intuitively, recognized the differences in human requirements for different types of work, and Adam Smith even felt such differences could be measured. But compensation for labor, which demanded use of these human requirements in varying degrees, was left to the vagaries of such factors as supply and demand, governmental edict, subsistence requirements, competition with slave labor, personal ability of the individual to "sell" himself, reputation of the worker, nationality, sex, member (or non-member) of some organization, economic conditions, ancient prejudices against manual labor, glorification of predatory and mental occupations, and many other purely subjective contributing elements.

Thorstein Veblen. To evaluate some of the philosophical aspects of the period ending with World War I, and to
trace the connecting links between previous periods, reference is made to the sardonic sagacity of Thorstein Veblen. However, as in the case of Adam Smith, the interest here is not so much in his economic theories, as in Veblen's analysis and insight into the essential character of work and its development up to his time.

Thorstein Veblen in *The Instinct of Workmanship* (50) proposes a penetrating concept of the fundamental nature of work and the changing relationships of workmanship to business and industry. Although he is writing in 1914, prior to the development of job evaluation, his analysis can logically be extended to cover this particular phase of "work." First, a distinction is made between the "pecuniary management" phase and function of business ("the gainful manipulation of property") and the productive, technological phases. Usually, people connected with the former have no real appreciation of materialistic cause and effect, the foundation of mechanical industries. As Veblen puts it,

The discipline of the business occupations should accordingly run to the habitual rating of men, things and affairs in terms of emulative human nature and of precautionary wisdom in respect of pecuniary expediency. Instead of workmanlike or technological insight, this discipline conduces to worldly wisdom. (50, p. 191)

On the other hand, the workman, technicians, engineers, etc., are trained in, and have developed a habit of thought related to, material facts and the effect of forces (either
These terms are, of course, used in their broadest sense, but the point is that the "habit of thought" of this group in industry pertains to workmanship, technology, and proximately to "mechanical" efficiency, rather than to the pecuniary advantages that might accrue from a given action.

This phenomenon, noted by Veblen, is not an "over-night" development, but the result of centuries of gradual growth and change. The beginnings of our modern era began with the handicraft stage, in which the end-product and the worker were more closely associated than generally is the case in industry today. By virtue of his own "skill, dexterity and judgment" (43, p. 5) the craftsmen created his product, and in so doing became the owner of this product and received his income from its sale. This constant discipline formed the habits of thought, not only of the craftsman, but of the community at large. This same attitude persists today among workmen, however under different circumstances and with different consequences. For example, after a man works at a particular machine for a length of time, not only he, but his associates tend to impute certain "ownership" rights between that man and the machine: it is "his" machine. This way of thinking loses much of its personal implications in quantity production work as far as the product is concerned. Each workman contributes such a relatively small proportion to
the total effort, that he does not feel that the end product is "his."

Veblen likewise develops the idea that in handicraft work the artisan controls the manipulation of the tools, and imparts some of his "personality" into the product. He is responsible for the forces exerted or has direct control of them, thus creating articles of use, each a little different -- he was an artisan. The industrial revolution gradually substituted mechanical for human force, the machine's skill for manual dexterity, and more recently electronic "brains" for human thinking functions. It is not implied that such developments have completely taken over (nor is it contemplated that they will) human effort, skill, and intelligence. Thus, in the machine age the situation is reversed, and the machine is in the position of controlling the manual activities of the workman. Recognition must be given to the fact that this "taking over" has not been a uniform phenomenon, but is evident in varying degrees at any one stage or locality. However, the trend is toward increased "automation," particularly in process and mass production industries.

The change from handicraft to machine technology is, among other things, a change from a personal, creative, qualitative approach to that of an impersonal, productive, 

1 Indeed, some of the craftsman ship of the "Great Artificer" was imputed into the work of the handicraft worker.
quantitative approach and habit of thought. The development of modern science, which is based, in part, on the postulate of cause and effect, has changed the thinking not only of scientists and the immediate beneficiaries of their endeavors, but of people in general. No longer do people look for mysterious and mythical explanations of natural phenomena. The relationship of modern science and craftsmanship is expressed by Veblen when he states that: "It is the unique distinction of modern science, particularly as it comes into view in its early phases, that its concept of causality is drawn not simply in terms of workmanship but specifically in terms of craftsmanship. There need probably be no argument spent on the thesis that the sense of causality is, by and large, a particular manifestation of the sense of workmanship. But the sense of workmanship in its native scope apparently covers something more than the manual efficiency of the skilled workman simply."

(50, p. 263) Thus, cause and effect, finding recognition in the application of manual dexterity in creating an object of beauty or usefulness (or both) by the handicraft age workmen, began this conditioning for habits of thought akin to scientific analysis.

Another field, peculiar to our modern era (as defined above), that of trade and commerce (i.e., mercantilism and capitalism) with their hand-maiden, accountancy, and the price system, fostered an objective and impersonal view of
facts. The role of accountancy, as perceived by Veblen is given as follows:

Accountancy is the beginning of statistics, and the price concept is a type of the objective, impersonal, quantitative apprehension of things. Coincidently, because they do not lend themselves to this facile rating, facts that will not admit of a quantitative statement and statistical handling decline in men's esteem, considered as facts, and tend in some degree to lose the cogency which belongs to empirical reality. They may even come to be discounted as being of a lower order of reality, or may even be denied factual value. (50, p. 245)

Science, encouraging the quantitative attitude (habit of thought) in technological areas, and accountancy, accomplishing a similar function in pecuniary endeavors, leads to the present day emphasis on objective, quantified, analyses of facts and problems.

In relation to the impingement of these two basic concepts, science and accountancy, upon the over-all operation of an industrial (or business) establishment, the Industrial Engineer has a unique function. As stated above, the business managers usually have little concept or appreciation of the technological problems involved in their plant or factory. Their habits of thought and decisions are based on pecuniary considerations. It is necessary that data and recommendations regarding technological production factors be presented to these business managers in terms of cost, rather than mechanical, terms, for their decision. Veblen conceives the
Industrial Engineer\textsuperscript{1} as taking over "the functions assigned in economic theory to the 'entrepreneur'," a concept that, in a way, clarifies the role of the Industrial Engineer, and casts it in a broader setting. If this concept is to prove valid, the Industrial Engineer must recognize that there is a conflict between the standards of pecuniary efficiency and true workmanship, the latter which is the actual producer of (efficient) wealth. The competitive struggle conducted within the price system has resulted in placing a dollar rating on men, products, equipment, and work itself. The workman, who ordinarily has little opportunity to engage in the emulated practices of salesmanship, who has lost his former attitude of creativeness toward his work, and has been educated and trained in quantitative technological habits of thought, finds it difficult to arrive at a logical objective basis for determining his worth. Nevertheless, he considers himself a productive and efficient member of society, and has a certain amount of scorn for those whom he considers non-productive, that is, the salesmen, clerks, business managers and others involved in pecuniary manipulations which he does not always understand.\textsuperscript{2} In addition, the workman today is:

\textsuperscript{1} Although Veblen uses the term "efficiency engineer."

\textsuperscript{2} Veblen explains this attitude as follows: "from its beginnings down to the period of its dissolution the handicraft industry is an affair of the lower classes; and, as is well known, class feeling runs strong throughout the era, particularly through the centuries of its best development. Whether their conceit is wholly a naive self-complacency or
expected to have the ability to read and write, and handle certain types of mathematics, as well as have a working knowledge of selected machines and processes. He is far advanced in this respect over his brother of the handicraft stage. His thinking is conditioned by the materialistic logic of the machine age's cause and effect relationship. Thus formal schooling, plus generalized and specific technological knowledge, is a common prerequisite for skilled jobs.

Following through with the philosophical theories of Veblen, an interesting analysis is presented in his The Theory of the Leisure Class (51). The distinction, an invidious one to be sure, is made between worthy and unworthy occupations. As explained by Veblen:

The institution of a leisure class is the outgrowth of an early discrimination between employments, according to which some employments are worthy and others unworthy. Under this ancient distinction the worthy employments are those partly a product of affectation, the sentiment is well in evidence and marks the attitude of the handicraft community with a characteristic bias. The craftsmen habitually rate themselves as serviceable members of the community and contrast themselves in this respect with the other orders of society who are not occupied with the production of things serviceable for human use. To the creative workman who makes things with his hands belongs an efficiency and a merit of a peculiarly substantial and definitive kind, he is the type and embodiment of efficiency and serviceability. The other orders of society and other employments of time and effort may of course be well enough in their way, but they lack that substantial ground of finality which the craftsman in his genial conceit arrogates to himself and his work. And so good a case does the craftsman make out on this head, and so convincingly evident is the efficiency of the skilled workman, and so patent is his primacy in the industrial community, that by the close of the era much the same view has been accepted by all orders of society." (50, p. 245)
which may be classed as 'exploit: unworthy are those necessary everyday employments into which no appreciable element of exploit enters. (51, p. 8)

He further clarifies this theory, that even though it has little formal acceptance in modern economics, "it persists with great tenacity as a commonplace preconception even in modern life as is shown, for instance, by our habitual aversion to menial employments."

Although it appears contradictory, Veblen stresses the psychological fact that man is an agent and that: "By force of his being such an agent he is possessed of a taste for effective work, and a distaste for futile effort. He has a sense of the merit of serviceability or efficiency and of the demerit of futility, waste, or incapacity. This aptitude or propensity may be called the instinct of workmanship."

(51, p. 15)

**Between Wars Development (1920-1940).** During the first World War wages rose rapidly, but by 1920 leveled off, dropped in 1921, and continued slowly to rise until 1930, when the Great Depression drastically reduced employment, wages and prices (see Chart 2, Appendix C). If, (for comparative purposes) the base rates shown in Table XVI, Appendix D for the Franklin Manufacturing Co. are taken as typical for 1905, we find the rate for common labor ("putty and sand" in Paint Shop, yard men, gatemen, janitors and elevator men) to be $0.15 per hour, and for tool makers $0.325 per
hour. Since these are base rates, the average would be higher. However, since the Franklin Manufacturing Co. used the "prevailing wage rate" in the area (Syracuse, New York), it can be assumed that the rates were not minimum, but represented a figure approaching the average for the community. These rates (area average) gradually increased until 1916 (about a 20-25% increase) when the rapid advances to 1919-20 were made.

The year 1927 might be taken as representative of the period of the twenties. The National Industrial Conference Board (32) has published data concerning wages at that time. Taking the same occupations as cited above – common labor and tool maker – the average rates for New York State are given as follows:

**TABLE VI**

<table>
<thead>
<tr>
<th>Rate Range</th>
<th>Per Cent of Workers in Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Common Labor (Male Tool Maker)</td>
</tr>
<tr>
<td>Cents/Hour</td>
<td></td>
</tr>
<tr>
<td>16-25</td>
<td>1</td>
</tr>
<tr>
<td>26-35</td>
<td>1</td>
</tr>
<tr>
<td>36-45</td>
<td>52</td>
</tr>
<tr>
<td>46-55</td>
<td>43</td>
</tr>
<tr>
<td>56-65</td>
<td>10</td>
</tr>
<tr>
<td>66-75</td>
<td>38</td>
</tr>
<tr>
<td>76-85</td>
<td>37</td>
</tr>
<tr>
<td>86-95</td>
<td>15</td>
</tr>
</tbody>
</table>

Average Rate –

($/hr.) $0.450 $0.757

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It is evident that the wages paid to the common laborer (the scale minimum) increased more rapidly than did tool maker's. The ratio of these two rates at the Franklin Manufacturing plant was 1:2.17, while the 1927 figures show a ratio of 1:1.68. This letter ratio is approximately the same in 1925 for the motor vehicle industry in New York, Michigan, New Jersey, Ohio, and Pennsylvania, with Illinois being an exception at 1:2.22 (32, p. 121) "Helpers" and "laborers" are invariably at the lower end of the scale, but no uniform or consistent pattern appears for other jobs. Some of the reasons for inconsistencies in wages for specific occupations in different parts of the country are given by the National Industrial Conference Board as follows:

The factors which determine wage levels and trends offer a most fertile field for speculation and analysis. The uncritical observer is faced with wage anomalies which are difficult to explain. Instances are common of substantially similar skill and effort requirement's calling for vastly different amounts of remuneration. The wage theories of the past, successively discarded by economists, shed little light upon a subject which is so bound up with the complexities of modern industrial organization and administration. The general principle of labor supply and demand appears to the average plant executive to be the most reasonable explanation of wage movements, and yet the free operation of this principle is found to be constantly interfered with by artificial means. Again, taking the construction industry for illustration, the high building wages in large cities have undoubtedly resulted from the unprecedented activity in the construction field during the past few years, creating a large demand for building mechanics, but the equalization of supply with
demand has been hampered by labor organization which has interposed artificial obstacles to the free operation of demand and supply by creating virtual labor monopolies in the leading construction centers. (32, p. 20)

An examination of Table XVII, Appendix D will show the real money and rank differences of occupations in the motor vehicle industry in 1925. These rates may be taken as typical of the period in question. As mentioned above, the ratios of low to high rates are quite consistent, and are also shown in Table XVII. Taking similar ratios from "Table 30: Average Actual Hourly Earnings in Selected Occupations in Foundries and Machine Shops, 1925 (Source: U.S. Bureau of Labor Statistics, Bulletin 422)" (32, p. 119), the following also show consistency:

<table>
<thead>
<tr>
<th>State</th>
<th>Ratio of Low to High Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York</td>
<td>1:1.88</td>
</tr>
<tr>
<td>Connecticut</td>
<td>1:1.70</td>
</tr>
<tr>
<td>Illinois</td>
<td>1:1.72</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>1:2.08</td>
</tr>
<tr>
<td>Michigan</td>
<td>1:1.74</td>
</tr>
<tr>
<td>New Jersey</td>
<td>1:1.78</td>
</tr>
<tr>
<td>Ohio</td>
<td>1:1.79</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>1:1.85</td>
</tr>
</tbody>
</table>

Thus it can be seen that by this time (circa 1925) many of the patterns and problems that are recognized as typical today were beginning to crystalize. Division of labor, specialization, standardization of materials, products, methods, etc., functions such as personnel administration, industrial engineering, and collective bargaining began to
be accepted as an integral part of the industrial scene. The problem of wages and wage differentials became increasingly complex. Certain aspects of this problem as found in the twenties are summarized by the National Industrial Conference Board in this manner:

In comparing wages in different states it must be recognized at the outset that geographical boundaries have little, if any, effect upon whatever differences may be bound to exist. The general level of wages in one state may be appreciably above the level in another state, but this will be due to the presence in the first state of conditions and factors which cause inequalities in wage levels. For one reason or another... wages in certain industries, as a rule, exceed those in certain other industries. This may be due to peculiar hazards in the industry, a shortage of qualified labor, agreements with organized labor or other causes. Again, in one state there may be a greater number of large industrial cities, and since, generally speaking, wages in cities tend to exceed those in the more rural sections, because of the cost of living or other considerations, the average wage level will be influenced accordingly, therefore, while average wages in one state may differ considerably from those in another state, the difference will be due to the industrial and population characteristics of the states, and not to geographical boundaries.

... A comparison of average wage rates between different industries is unsatisfactory for the reason that relative degrees of skill, as well as the required proportions of highly and little skilled employees, vary between industries. The only wage rate comparison of any actual value is that of similar occupations within an industry. Even here an accurate comparison is difficult for reason that within an occupational classification the type of work required may vary considerably between establishments and consequently the rate of pay will differ. Individual merit or length of service may account for further differentials.
between the wage rates or apparently similar occupations. (32, p. 21)

To illustrate the long term trend in money wages and the differential between two main groups, common laborer and artisan, Cox (16, p. 74) presents a chart which was plotted (from tables of wages constructed by Dr. Ralph G. Hurlin, statistician for the Russell Sage Foundation), by Colonel Leonard Ayres, Vice-President of The Cleveland Trust Company. This chart is reproduced in Appendix C as Chart Number 2, and may be considered a continuation, (although weekly wages rather than relative earnings are used) of Chart Number 1. Chart Number 2 shows that, over the period 1820-1925, that in times of rising wages, the differential between money wages of skilled and unskilled workers tends to increase, while in times of stability (1800-1900 for example) or falling wages, the differential tends to decrease. This same trend is noticeable in Chart Number 1, Appendix C.

This rather general, and long term trend, may be concluded to be one of the few economic effects of considerations in connection with job evaluation. However, in any specific case, the establishment of a wage structure, although it may fit the pattern of the moment, is not greatly influenced by such long term movements. But during a period of emergency (e.g., war) when rapid changes take place in economic relationships, this trend is magnified, and, as in World War II, governmental controls were imposed to
offset, partially, both the general trend and the differential. This situation will be discussed in a later section.

During the period under discussion (1920-40) several important movements developed rapidly. The industrial psychologist, interested in such factors of work as fatigue, proper placement of personnel, employee's attitudes toward their jobs, and job analysis, was making real progress toward understanding work and the worker. His interest was more in the psychological elements of employee's relations to their jobs, than in the problem of how wages were to be determined. Not that he ignored the question of pay, because attitude surveys, for example, included this factor. Jobs were analyzed to form a basis for employment tests, placements, performance evaluation, training, and similar functions. The analysis was designed to determine which psychological and physiological factors (such as eye-hand co-ordination, visual and other sensory discriminabilities, memory, space and form perception, intelligence, judgment, etc., (see Viteles, Morris S. *Industrial Psychology* (52) were predominant in jobs, and attempted to quantify these factors, and by applying statistical techniques, to make them more meaningful and useful.

*Muensterberg and Industrial Psychology.* The interest of psychologists in industrial economics and problems began
with Hugh Muensterberg (*Psychology and Industrial Efficiency*, 1913, (31)). He proposed that applied psychology should be the link between the laboratory and the practical problems of industry and business. One of the basic concepts of psychology, which was just developing at the turn of the century, was that of individual differences. Muensterberg states that: "The study of individual differences itself is not applied psychology, but it is the presupposition without which applied psychology would have remained a phantom." (31, p. 10)

Muensterberg's philosophy regarding applied psychology was a "means-end" one, in which the scientist (psychologist) did not question the desirability of the "end," but only said: "...you must make use of this means, if you wish to reach this or that particular end." (31, p. 17) He thus approaches the problem by stating first the ends or purposes of industry, and then by scientific means, determine how these purposes can best be achieved. This basic approach is summarized as follows:

From this point of view we select three chief purposes of business life, purposes which are important in commerce and industry and every economic endeavor. We ask how can we find the men whose mental qualities make them best fitted for the work which they have to do; secondly, under what psychological conditions can we secure the greatest and most satisfactory output of work from every man; and finally, how can we produce most completely the influence on human minds which are desired in the interest of business. In other words, we ask
how to find the best possible man, how to pro-
duce the best possible work, and how to secure
the best possible effects. (31, pp. 23-4)

Some of the specific areas of applied psychology dis-
cussed by Muensterberg, but which can only be listed here,
are: placement of people in work for which they are best
suited, aptitudes, learning, training, motion patterns,
monotony, fatigue, physical and environmental influences, and
the psychological effects of such factors as economic demands,
advertisements, displays, imitation buying and selling. In
his discussion of "physical and social influences," which
stressed the effect of stimulants, especially alcohol, temper-
ature, amount of sleep, etc., Muensterberg has this to say
regarding the economic influence:

As the strongest factor, finally, the direct
material interest must be added to these condi-
tions. The literature of political economy is
full of discussions of the effect of increase of
wages, of the payment of bonuses and premiums, of
piece-wages, of promised pensions, and, as far as
Europe is concerned, of state insurance. In
short, the whole individual financial situation
in its relation to the psychophysical achievement
of the wage-earner is a favorite topic of economic
inquiry. We cannot participate here in these in-
exhaustable discursions, because all these ques-
tions are today still so endlessly far from the
field of psychological experiments. . . .It is
not improbable that the method of economic psycho-
logical experiment may also quickly lead beyond
the more elementary problems, as soon as it is
systematically applied, and then it, too, may
conquer regions of inquiry in which today no
exact calculation of the psychological factors
seem possible.

If such an advance is to be a steady one, the
economic psychologist will emancipate himself from chance question of what problems are at this moment important for commerce and industry and will proceed systematically step by step from those results which the psychological laboratory has yielded under the non-economic points of view. Many previous psychological or psychophysical inquiries almost touch the problems of industrial achievement. We know how the consciousness of the task to be performed has an organizing influence on the system of those psychophysical acts which lead to the goal. The experiment has shown under which conditions this effect can be reinforced and under which reduced. Pedagogical experiments have also shown exactly what influence belongs to the consciousness of the approach to the end of work; the feeling of the nearness to the close heightens the achievement, even to the fatigued subject. It would not be difficult to connect psychophysical experiments of this kind with the problems of the task and bonus system, which is now-a-days so much discussed in industrial life. The practical successes seem to prove that the individual can do more with equal effort if he does not stand before an unlimited mass of work of which he has to do as much as possible in the course of the day, but if he is before a definitely determined, limited task with the demand that he complete it in an exactly calculated time. Scientific management has made far-reaching use of this principle, but whether constant results for the various industries can be hoped for from such methods must again be ascertained by the psychological experiment. (31, p. 235-6)

A further comment by Muensterberg indicates a realization of the importance of economic factors to applied psychology. He says:

The task of psycho-technics is accordingly to determine by exact psychological experiments how this mental effect, the satisfaction of economic desires, can be secured in the quickest, in the easiest, in the safest, in the most enduring, and in the most satisfactory way.

But we must not deceive ourselves as to the
humiliating truth that so far not the slightest effort has been made for the answering of this central scientific question. (31, p. 244)

From this brief analysis of the early thinking in "industrial psychology," it is apparent that the psychological nature of the "economic demands," including wages, was beginning to be recognized. However, no direct reference is made to the problem of different levels of wages and the psychological factors involved therein. Nevertheless, as Viteles (53) points out: "The publication of Munnsterberg's program served as a stimulus for the initiation of investigations in the field of industrial psychology throughout the world."

The industrial engineer during this period was concerned with (among other things) job methods, time standards, and wage incentive systems. Job methods were studied with a view to improving the efficiency of the operation by eliminating waste motions, proper arrangement of work place, etc. Detail, elemental motions were analyzed and defined, with much credit going to the Gilbreths, Frank and Lillian, for the development of the system of "therbligs" to use as a "short-hand" to describe minutely an operation.

Another phase of business and industrial activity that concerns the general sphere of work, labor, and wages, and that received accelerated attention after World War I, was

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1 According to Ralph M. Barnes: "... a short word with which to refer to any of these seventeen elementary subdivisions of a cycle of motions." (5, p. 95)
that of "organization." Walters defines organization as follows:

Organization is the division of work into its proper functions, jobs, and elements; their arrangement into correct relationships; and the assignment of them to individuals with clear definitions of responsibility, authority, and duties which will accomplish the policies of the establishment. (55, p. 46)

Increasing size, specialization and need for control of activities, led to specifying in more and more detail the duties and jobs of individuals in the establishment. Such descriptions of jobs (or positions) as used in connection with organization as defined above, either were similar to a methods study — the step by step procedure — for routine jobs, or listed regular, periodic and occasional duties for non-routine jobs. These job descriptions, however, were not along the job analysis idea referred to above which dealt with so-called "job requirements" such as physical and mental requirements, education, personality, dexterity, strength, ability to work under hot, noisy conditions, etc., but usually did not specifically list duties. It was frequently the case, however, that job "duties" and job "requirements" were combined, together with necessary factual data, into a job "specification." Some of the earliest examples of these developments occurred in the Standard Oil Company of New York (Socony Vacuumb), Youngstown Sheet and Tube Company, and the Union Carbide Company (54), during the 1920's.
Industrial Sociology. The 1920's also saw another new area of science development - that of "industrial sociology." However, some of the earlier sociologists such as Émile Durkheim (1858–1917), and W. G. Sumner (1840–1910) began to advance theories related to work groups prior to the twentieth century. For example, in explaining Durkheim's theory of division of labor, Emory S. Bogardus (The Development of Social Thought (8)) makes this observation:

Increasing density of population has made specialization necessary. Survival has required specialization. With this division of labor has come division of interest - and conflicts. Industrial conflicts are due in part to division of labor. Occupational specialization, moreover, has resulted in a decline of mechanical solidarity, or like-mindedness. Increase in organic solidarity, that is, in organized and co-ordinated solidarity, does not keep pace with the decrease in mechanical or like-minded solidarity caused by increasing division of labor and specialization. Hence, Durkheim developed the concept of constraint as being society's only recourse in order to meet the increasing conflict nature of societal life. (8, p. 421)

Then, the rather ruthless pronouncements of W. G. Sumner (The mores are always right") included some that "took an extreme and untenable position," (8) but were nevertheless valuable for the strong light they threw on social institutions and thought. He defended capitalism as

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1 "The field of industrial sociology may be conveniently defined as the study of: (1) work groups and work relations, (2) the role the worker plays in work groups, and (3) the social organization of work plant society." (29)
being "based on liberty, on contract, and on private property," (44) and was a strong proponent of *laissez faire*, and held with disdain the social reformers - "meddlers" - stating that, "If the social doctors will mind their own business, we shall have no troubles but what belong to Nature." But he also defended trades unions and pointed out their roles:

Trade unions, then, are right and useful, and it may be that they are necessary. They may do much by way of true economic means to raise wages. They are useful to spread information, to maintain esprit de corps, to elevate the public opinion of the class. (44, p. 95)

Sumner's evaluation of the basis of this country's social structure is important, and is expressed as follows:

In our modern state, and in the United States more than anywhere else, the social structure is based on contract, and status is of the least importance. Contract, however, is rational - even rationalistic. It is also realistic, cold, and matter-of-fact. A contract relation is based on a sufficient reason, not on custom or prescription. It is not permanent. It endures only so long as the reason for it endures. In a state based on contract, sentiment is out of place in any public or common affairs. (44, pp. 24-5)

The contract concept, exemplified in company-union agreements, however, does not have to be cold and matter-of-fact, but a basis for mutual cooperation, understanding, and the settlement of problems arising from the relations of employees and management. In this connection, Sumner recognized the value of management, and stated that:

... The ability to organize and conduct industrial, commercial, or financial enterprises is
rare; the great captains of industry are as rare as great generals. The great weakness of all co-operative enterprises is in the matter of supervision. Men of routine, or men who can do what they are told are not hard to find; but men who can think and plan and tell the routine men what to do are very rare. They are paid in proportion to the supply and demand of them. (44, p. 53)

While Sumner refers to the modern (1883) industrial system as "a great social cooperation, . . . automatic and constructive in its operation" he is fully aware of the conflict between "capital" and "labor" (i.e., the classes represented by these terms). In regard to the so-called communal-ity of interests between management and workers, he pointedly remarks that: "To say that employers and employed are partners in an enterprise is only a delusive figure of speech. It is plainly based on no facts in the industrial system." (44, p. 85)

Referring to the previously noted statements of Sumner regarding "contracts," it is appropriate to close the discussion of this phase by quoting his theories of wages and the labor market. In the following, it will be noted that one of the fundamental problems of sound wage administration, knowledge of the labor market, is set in close relationship to the question of contract and labor organization:

No bargain is fairly made if one of the parties to it fails to maintain his interest. If one party to a contract is well informed and the other ill informed, the former is sure to win an advantage. No doctrine that a true adjustment of interest follows from the free play of interests
can be construed to mean that an interest which is neglected will get its right.

The employees have no means of information which is as good and legitimate as association, and it is fair and necessary that their action should be united on behalf of their interest. They are not in a position for the unrestricted development of individualism in regard to many of their interests. Unquestionably the better ones lose by this, and the development of individualism is to be looked forward to and hoped for as a great gain. In the meantime the labor market, in which wages are fixed, cannot reach fair adjustments unless the interest of the laborers is fairly defended, and that cannot, perhaps, yet be done without associations of laborers. No newspapers yet report the labor market. If they give any notices of it - of its rise and fall, of its variations in different districts and in different trades - such notices are always made for the interest of the employers. Redistribution of employees, both locally and trade-wise (so far as the latter is possible), is a legitimate and useful mode of raising wages. The illegitimate attempt to raise wages by limiting the number of apprentices is the great abuse of trade-union. (44, pp. 89-90)

Such was the thinking and contribution of one group of earlier sociologists. Their approach might be considered inductive and moralistic. However, another group, starting with Jacques Quetelet (1796-1875) and Frederic Le Play (1806-1882) introduced social statistics and the scientific method in sociological studies. This was an exceedingly important development in that it completely removed the science of sociology from the realm of the social reformers. Dr. Bogardus points out other values of this development as follows:
The statistical method has been carried forward by a large number of social investigators. With averages, modes, and medians, and so on, it is now possible to make accurate quantitative studies. Current statistical methods include the use of index numbers, frequency tables, discrete series, deviations, skewness, correlations, probably [probability] error, measures of reliability. Statistics has thrown a flood of light upon important phases of societal life, such as the economic, where wage scales and price levels are significant concepts. (8, p. 561)

It was becoming evident to social scientists (economists, psychologists, sociologists, etc.) that human experience could not be compartmentalized, but could be analyzed only in terms of the interactions of a variety of factors. Barnes (4) quotes Franklin H. Giddings' statement that, "Sociology can be made an exact, quantitative science if we can get industrious men interested in it," indicating the possibility of formulating laws and theories by the scientific method, which would include the quantification of the factors referred to above. These factors are biological, sociological, psychological and economic as well as physical. Talcott Parsons, writing in Barnes' Contemporary Social Theory (4) under the title of Sociological Elements in Economics concludes with this footnote:

Striking evidence that concrete economic phenomena (in this case productive efficiency of the worker), are directly dependent on the non-economic (in the factor sense) elements of

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1 In American Journal of Sociology, Volume XV (1909-10), p. 196.
institutional integration of the social environment of industry is brought out in the recent book of Elton Mayo, the Human Problems of An Industrial Society. In many respects it may be considered a model study in the 'new institutionalism'. (4, p. 646)

The preceding brief outline will serve to show that until the time of Elton Mayo and the "Hawthorne Experiments" in the 1920's, sociologists had not applied the scientific method to sociological problems of industry on any significant scale. Therefore, it is with these experiments that "industrial sociology" has its beginnings as an important phase of the study of industry. The relative lateness of the entry of industrial sociology into the field is further evidenced by the fact that the first textbook entitled "Industrial Sociology" was published in 1951.¹ There have been, of course, many excellent books and articles on this subject, beginning in 1919 with R. M. MacIver's Labor in the Changing World, through the works of Elton May, Roethlishberger, Whitehead, and their associates at the Harvard Graduate School of Business Administration, Warner and Low (The Social System of the Modern Factory), etc. Miller and Form trace the maturation of industrial sociology as reflected in the attitudes of Mayo as follows:

Industrial sociology is the youngest of the three basic sciences to turn its focus and economic and work behavior. In the last decade

¹ Miller and Form, Industrial Sociology, (29).
attention has been moving from the worker as an individual to the worker as a group member. The impact of the large-scale industrial experiments at the Western Electric Co., caused Elton Mayo and his staff to alter their entire axis of thought, from the proposition that all social problems are individual to the proposition that all individual problems are essentially social. In July, 1925, after many years as a psychologist in industry, Mayo stated his thinking in positive terms. He wrote in Harper's Magazine 'when we talk of social problems, we are apt to forget that every social problem is ultimately individual. . .'. By 1945 Mayo was writing, 'in industry and in other human situations the administrator is dealing with well-knit human groups and not with a horde of individuals. . . . Man's desire to be continuously associated in work with his fellows is a strong, if not the strongest, human characteristic.' (29, p. 21)

Sociology centers its attention on the group as an observational unit, whereas psychology is concerned with the individual. Industrial sociology then is related to groups in industry, with particular emphasis on organization, both formal and informal, worker morale and teamwork, the adjustment of the worker to his social environment, and related sociological problems of economies, the community, education, etc. Many research projects and activities have been and are making an important contribution to the theory and practice of group relations. A large per cent of these researches are joint projects with researchers in other fields such as industrial psychology and personnel administration, and with industrial organizations. Greater understanding of motivations of workers, leadership, organization structure, communication and social trends is resulting from these reports.
This section on the role of industrial sociology has been presented as a continuous development in order to preserve the concept of this important field as a unit. As will be shown in a later section, the theory and methodology of industrial sociology can prove to be of valuable aid in the matter of job evaluation.

Summary of Forces Affecting Wage Differentials. Before touching on "job evaluation," which is associated with, and dependent upon, job "duties," "requirements," "analysis" and "specifications," it is pertinent to note that these developments occurred because of several underlying factors. Some of these have been mentioned, such as growth in size of individual companies, specialization of the many functions of operation of a company, etc. Also the development of a factual, systematic approach to the issues is evident. The so-called idea of "scientific management" (but not scientific in the sense as used in the physical sciences, for example) introduced the analytical method of measuring and quantifying work phenomena which had previously been in the realm of guess, hunch, tradition, or "rule-of-thumb." Many aspects of "scientific management" were and are open to legitimate criticism, and Labor, particularly, objected to systems of wage incentives, for example, installed under the name of "scientific management." It is not the purpose
of the writer to examine this issue. Nevertheless, as methods of measuring physiological and psychological traits and performance of human beings became more generally adopted, and psychologists and others were trained in these fields, the demand for more exact knowledge regarding work and specific jobs increased.

Another force became increasingly important during this period that advanced the concept of the factual and analytical approach. This force was organized labor. After 1936, the industrial union, particularly the Congress of Industrial Organizations, exerted powerful pressures on industry, not only individual companies, but entire industries (steel, rubber, automobile, etc.) in regard to wages, hours, working conditions, seniority and a large number of other issues. In order to negotiate intelligently and successfully (?) with these unions, the managements of companies required detailed, exact knowledge regarding a multitude of issues. Knowledge of jobs, as supplied by such means as job specifications, became an important tool in contract negotiations as well as everyday conduct of personnel matters.

Economic theories of wages were constantly being advanced, but there seems to be little in them that pertains to the problem of remuneration of employees at various levels and on different jobs. Paul H. Douglas' *The Theory of Wages* (17) recognizes the problem, but relates it to economic theory in this manner:
But while the differences between men may perhaps be measured and paid in terms of output, the basic quantities of labor which are common to all cannot be appraised in any such fashion.

If we define labor in terms of output, we are indeed driven to ascribe these differences in output to differences in labor, and in effect to deny the enhancement of productivity by machinery as well as to deny the diminishing yield of land. We would thus conceal two of the most important forces in our whole economic life, and in trying to simplify our problem we would, instead, have confused and falsified it.

However useful differences in output may therefore be in measuring differences in the economic merits of men, we cannot accept output as the unit by which to measure those basic performances of men which are characteristic of all labor. However heroic the abstraction, we shall have to assume as our unit of measure an hour of work which is characterized by at least a minimum of intensity, skill, and ability. In common practice business men deal with such units of labor when they contract for the average run of unskilled labor, and the rate for this class furnishes in turn the basing point upon which the differentials for the other classes of labor are erected.

It is then with such units of labor that we shall deal in the chapters which follow.

(18, pp. 15-16)

To transpose the proposition stated by Douglas above from theory to practice, it would be necessary to define "a minimum of intensity, skill, and ability" and "the average run of unskilled labor" so as to be uniformly realistic to all parties to the contract. Actually, of course, in many instances there is an "understanding" within a community as to the rate for common labor, and it is frequently, although not always, the lowest rate on the scale. However,
neither this rate (nor any others), are subject purely to
the economic "laws" or forces, but are influenced by minimum
wage legislation, union pressures, etc. Further discussion
regarding economic theories will be given in Chapter IV, but
the quotation from Douglas was presented to illustrate the
theory of wages (as pertains to wage differentials) advanced
during the period 1920-1940.

As indicated above (pp. 89-90) in a quotation from the
report of the National Industrial Conference Board (32, p. 20),
wage theories propounded by economists in the past had been
"successively discarded." Although supply and demand have a
bearing on the wage structure of a given company or plant,
it is an imperfect force, and many other forces also enter
into the situation. One of these "forces" influencing wages
is known as the "going" or "prevailing rate." But the inade­
equacy of using the "going rate" is explained by J. O. Hopwood
in his Salaries, Wages and Labor Relations (23) to indicate
one trend of thought on this problem in 1937:

For many years occupational classifications
including definitions and salary schedules have
been in use in civil service institutions as means
to orderly treatment of the problem. Until the
last few years, however, they were uncommon in
industry. It has been generally taken for granted
that salaries and wages are just the prices or
'going rates' paid in a community for labor of
various kinds.

Reflection upon the situation discloses that
the 'going rate' theory of wages in modern indus­
try is obsolete in every exact sense. People work,
not in industry at large, nor as classes of workers, but as individuals employed in enterprises. In each enterprise they work in specialized jobs, not in competition but in cooperation by organization. The enterprise is a self-contained, self-sustaining entity of production. Organizations are developed differently and some are more prosperous than others. Their jobs differ and individuals must be trained within an organization to fill their jobs efficiently. They must be encouraged to retain them and develop themselves if the enterprise is to be conducted economically and compete with others. Realizing these circumstances we cannot wonder why 'going rates' are not to be found in any exact sense. (23, p. 111)

The wage structure, or scale, of a given company must, then, establish rates of pay for all employees in all positions or jobs. A problem arises thereby, wherein the wage differentials within the scale must be determined. It is obvious that this had been done for centuries, was, is and will continue to be a function of business and work. However, the growing complexities of the wage problem, and developing analytical or quantitative ('scientific') habit of thought of people in industry, and other factors referred to above, resulted in the starting of a movement during the twenties (already anticipated by the government civil service in their classification program) to analyze and systematize the wage differential structure. This movement became known as Job Evaluation, the main subject of this thesis.
Definition, and discussion of meanings of terms are treated in detail elsewhere in this thesis (see Chapters I and IV), but it appears desirable to clarify the nature of job evaluation as it was evolving during the twenties and thirties. Its basis was factual knowledge regarding jobs from the standpoint of those characteristics which affected the relative worth of the jobs. Certain theories and postulates were propounded in order to guide consistently the process by which these relative worths were determined. One of these postulates was "equal pay for equal work." Another postulate was that jobs could be objectively defined, described, analyzed, and cataloged according to a systematic procedure that would result in an "equitable" wage structure within a given organization. Still another postulate was that the job only was being evaluated, and not the man on the job. Rating of the man was another and separate program entirely.

The idea of standardization was gaining wide acceptance following the first World War with both Government and private agencies fostering standards of a technical nature.  

Agencies Include War Industries Board (1917-18); United States Chamber of Commerce's Fabricated Products Division (1920); Division of Simplified Practice, Bureau of Standards, United States Department of Commerce (1921); American Standards Association; American Society of Mechanical Engineers, etc. Merriam-Webster (33) defines a standard
Standards in manufacturing tools and equipment, and in shop methods had been advocated by Taylor: "The economy to be gained through the adoption of uniform standards is hardly realized at all by the managers of this country." (45, p. 124) Thus, the idea of standardization was also basic to the development of job evaluation, in that each job was defined as to duties, requirements and characteristics, and such data was used to determine the proper "level" for that job. It will be apparent immediately that such an approach to jobs implies that the controllable physical and environmental conditions will also be standardized and remain uniform within specified limits for some period of time.

An Early Job Evaluation Plan. One of the first job evaluation installations to achieve continuing existence and to be reported in complete detail was at the Sperry Gyroscope Company. Merrill R. Lott, in his Wage Scales and Job Evaluation (27), published in 1926, explains the basis, principles and procedures of this plan. This plan might be characterized as: "r. That which is set up and established by authority as a rule for the measure of quantity, weight, extent, value or quality. . . 5. That which is established by authority, custom, or general consent, as a model or example or pattern; test; in general, a definite level, degree, material, character, quality, or the like, viewed as that which is proper and adequate for a given purpose. . . 7. In business, a carefully thought-out method of performing a task, or carefully drawn specifications covering material or equipment."
ized as a weighted-point type, consisting of fifteen factors, each assigned a weight as shown in Table VI below. Within each factor a series of values was assigned, for example, 1 through 10, as in the case of Factor One, based on number of years experience as follows:

**TABLE VI**

<table>
<thead>
<tr>
<th>Scale of Points for Experience Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Years' experience or more - assign 10 points</td>
</tr>
<tr>
<td>9 to 10 Years' experience or more - assign 9 points</td>
</tr>
<tr>
<td>8 to 9 Years' experience or more - assign 8 points</td>
</tr>
<tr>
<td>7 to 8 Years' experience or more - assign 7 points</td>
</tr>
<tr>
<td>6 to 7 Years' experience or more - assign 6 points</td>
</tr>
<tr>
<td>5 to 6 Years' experience or more - assign 5 points</td>
</tr>
<tr>
<td>4 to 5 Years' experience or more - assign 4 points</td>
</tr>
<tr>
<td>3 to 4 Years' experience or more - assign 3 points</td>
</tr>
<tr>
<td>2 to 3 Years' experience or more - assign 2 points</td>
</tr>
<tr>
<td>1 to 2 Years' experience or more - assign 1 point</td>
</tr>
</tbody>
</table>

Thus, as an example, the job of toolmaker was scored 23 (for Factor One) times 10 (for 10 years' experience or more) to equal 230 points on this Factor, while the job of common laborer scored 23 x 1 = 23 points on the experience factor. All other factors were handled in a similar manner and a total score for each job thereby determined. For example, the Toolmaker received a total of 762.8 points and Common Laborer, 243.1. The weights shown in Table XVIII, Appendix C, were determined by averaging the opinions of a group of employees. There was a correlation (product moment) of

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0.746 between the weightings of the two groups indicating a fair degree of agreement; however, it will be noted that the "final" weights deviate in several cases from the "combined" weights (and there seems to be some ambiguity in this latter, in that all the weights are not the arithmetic means of the "executive group" and "committee" weights) toward the weights assigned by the "executive group."

To determine actual money wages from the procedure referred to above, the rates for Toolmaker and Common Laborer were first agreed upon as fair and representative of the wages paid in the community. Then, using a diagram with Cents per Hour as the abscissa and Index Figures (ratings) as the ordinate, the points (0.90, 762.8) and (0.53, 243.1) were plotted. Finally, a straight line was drawn between these two points, from which the money rates for all other jobs (as point weights were determined) could be read. These rates were maximums.

In addition to determining maximum rates as above, a merit rating program which translated merit recognition into a pay adjustment was included in Lott's plan. Each employee was rated, on a comparative basis with other employees in his group, on four factors:

- Experience
- Knowledge
- Use of Knowledge and General Value
- Physical Suitability
Depending on his ratings, he was assigned a score (maximum of 100), and his pay adjusted accordingly. The schedule, for example, of Toolmaker's wage rates is computed as follows:

<table>
<thead>
<tr>
<th>Score</th>
<th>Toolmaker - Wage Rate Applied</th>
</tr>
</thead>
<tbody>
<tr>
<td>95 - 100</td>
<td>$1.90 per hour (maximum rate)</td>
</tr>
<tr>
<td>90 - 95</td>
<td>.87 per hour</td>
</tr>
<tr>
<td>85 - 90</td>
<td>.83 per hour</td>
</tr>
<tr>
<td>75 - 85</td>
<td>.80 per hour</td>
</tr>
<tr>
<td>65 - 75</td>
<td>.77 per hour</td>
</tr>
<tr>
<td>60 - 65</td>
<td>.73 per hour (maximum rate)</td>
</tr>
</tbody>
</table>

The basis for this (merit) rating was the "man-to-man" type of rating, with code letters A, B, C and D used to indicate the relative position or equality compared with other employees in a particular classification, with each factor applied separately.

Mr. Lott also presented variations of the above plan to apply to clerical workers and to supervisors. This indicated the need for different factors and point values depending upon the general, broad classification of work.

To summarize the principles of this early attempt at job evaluation, Lott lists the following:

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1 From, Lott, M. R., Wage Scales and Job Evaluation. (27, p. 102)
1. An analysis of work requirements and the preparation of detailed job specifications to serve as a basis for analyzing the relative worth of both occupations and individuals.

2. The determination of equitable wage rates for various occupations.

3. The distribution of payroll on the basis of individual merit.

The Lott plan is of interest for several reasons in addition to its being the first of its type. The use of factors, or job characteristics, and the assignment of points of different values or weights to these factors has been a basic feature (modified) of the majority of job evaluation plans since that time. However, Lott included rating of the individual employee as an integral part and step in the wage rate determination, which has not been accepted in later plans, but handled as a separate function under the name of "merit rating," "performance rating," "performance evaluation," "man rating," etc. So-called merit increases are based on this latter type of rating, but not so the basic rate for an occupation.

Such factors as "Scarcity of Labor Supply," "Difficulty for an Employee to Secure Similar Work Elsewhere," and "Prevailing Rate of Pay" have nothing to do with the job, per se, although supply and demand, and "going rates" do have an influence on rates, particularly the general level of rates. These influences were considered when the "wage rate - point value" curve was established, as explained above. Consequently-
ly, such factors are not generally included in job evaluation plans of later date.

The general approach of detail job description and specifications, the use of committees for pooled judgments and the analytical method developed under the plan described by Lott have found rather wide acceptance as more and more companies adopted some form of job evaluation.

A more exhaustive analysis, including a statistical evaluation, could be made of the plan and data in Lott's book, but this would be purely academic procedure and add little to the appreciation of this plan. The more comprehensive type of analysis will be reserved for current plans.

United States Civil Service Classification System. No historical review of job evaluation would be complete without reference to the job classification program used by the Federal Government. The principal agency responsible for civilian personnel activities is the Civil Service Commission, created by Act of Congress in 1871. The Classification Act of 1923 (75), however, is considered the real beginning of "position classification." This Act established a Personnel Classification Board (ex-officio; transferred to the Civil Service Commission in 1932) which was to make rules and regulations to:

Provide for ascertaining and recording the duties of positions and the qualifications required of incumbence, and it shall prepare and
publish an adequate statement giving (1) the
duties and responsibilities involved in the
classes to be established within the several
grades, illustrated where necessary by examples
of typical tasks, (2) the minimum qualifications
required for the satisfactory performance of
such duties and tasks, and (3) the titles given
to said classes. (75, p. 5)

This Act established several broad classes and grades
within the classes which were carefully defined and annual
rates of pay specified. For example, the Clerical, Adminis­
trative, and Fiscal Service (CAF), grade two (2) is de­

inged as follows:

Grade 2 in the service, which may be re­
ferred to as the junior clerical grade, shall
include all classes of positions and duties of
which are to perform, under immediate supervi­
sion, assigned office work requiring training
or experience but not the exercise of independent
judgment.

The annual rates of compensation for posi­
tions in this grade shall be $1320, $1350, $1440,
$1500, $1560, $1620, and $1680. (75, p. 10)

Briefly, the basis for assigning a job to a specific
class and grade was the job description. This description
was compared, qualitatively, with the standards set by the
Personnel Classification Board, by an analyst or analysts,
with proper review by designated authorities. The underlying
objective or goal was a systematic approach to reasonable
consistency in employees' pay. The Act was amended from time
to time, and finally in 1948, it was repealed by the "Class­
ification Act of 1949."(76)
Separate from the positions covered by the Classification Acts are so-called "ungraded" or "blue-collar" positions. The Navy, for example, has been operating under an Act of Congress dated July 16, 1862 (12 Stat. 587-34 U.S.C. 505), which provided:

That the hours of labor and the rate of wages of the employees in the Navy Yards shall conform, as nearly as is consistent with the public interest, with those of private establishments in the immediate vicinity of the respective yards, to be determined by the commandants of the Navy Yards, subject to the approval and revision of the Secretary of the Navy (84, p. 1)

Four groups were included in this act:

I. Common laborers and other unskilled workers.
II. Skilled laborers and helpers in crafts and trades.
III. Skilled mechanics and craftsmen.
IV. Supervisors of workers in I, II, and III groups.

The medium for wage determination for these groups (also in the Army and later, Air Force) was the "wage board." These boards have been appointed annually for appropriate districts, have made wage surveys of comparable jobs in private companies, and set wage patterns for the particular Navy Yard or other shore establishments within a given area.

The Commodity Concept of Labor. Although at this time (the 1920's), programs were being launched similar in purpose to those mentioned above (Lott, Navy Wage Board, Civil
Service Position Classification, etc.), and many companies were seeking a more objective and analytical process to determine wages, a widespread and vigorously defended basis for wages was that presented by Jacob D. Cox, Jr., President of The Cleveland Twist Drill Company, in *The Economic Basis of Fair Wages* (16) in 1926. Some of the theses advanced by Mr. Cox can be summarized as follows:

1. "The price of labor is in fact merely a matter of demand and supply, exactly like the prices of all commodities." (16, p. 69)

2. "All that employers seek is freedom for the wage level to respond to these natural forces (supply and demand); freedom to rise, when the natural tendency is to rise, which no one opposes, and freedom equally to fall when the natural tendency is to fall." (16, p. 69)

3. Increasing productivity is the only basis for higher standards of living under a system of free competition.

4. Organized labor follows the "fallacious" belief that high wages are the cause of high living standards.

5. Industry-wide collective bargaining is hurtful to the public and "...it seems certain that if the public concludes to put an end to such widespread collective agreements there is ample power in our legislators to do so under the conspiracy laws." (16, pp. 99-100)

6. "We thus come to the conclusion that the fundamental ethical rule regarding wages is that wages of every group or class should be justly and fairly related to the wages or salaries of all other

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1 Reliable survey data regarding prevalence of job evaluation at this early date not available.
groups or classes in the nation, considering the nature of the work performed; and the wage level of the nation as a whole should be such as to secure full normal employment for all who wish to be employed, in other words a wage level that is the natural result of the economic forces of supply and demand." (16, p. 89)

7. Wage justice is achieved through knowledge and freedom. Widespread knowledge of rates paid in various localities, industries and trades, with each employer and worker free to offer or accept (or refuse) any given job or wage will assure "every worker that he can secure the highest pay that any employer is able or willing to pay him for his particular grade of services." Cox concedes that "special cases" may require action other than that called for by knowledge and freedom. He indicates that collective bargaining or other collective action in the past has undoubtedly been the "most effective remedy" in such cases.

A brief comment seems in order here. The philosophy propounded by Mr. Cox is the old one of laissez faire, "natural" laws, and a perfect market. As pointed out by the Industrial Conference Board, many other factors enter the picture which required discarding these old theories as practical, working, bases for action. The "perfect" market just does not exist, and as industrial society becomes more complex, knowledge of the market is increasingly difficult to obtain. This factor will be discussed later in connection with certain phases of job evaluation. Mr. Cox also retains the commodity and class idea of labor, with the individual worker seeking the "best" position by individual bargaining. The only type of collective bargaining he recommends as acceptable is that represented by "shop committees and company unions." He further proposes "that such problems as
those we are dealing with are capable of formulation and solution by the methods of science." In this approach, the facts he proposes to test hypotheses with are economic facts relating to supply and demand, productivity, prices, etc. It does not occur to Mr. Cox that social, human, and institutional elements are also involved in determining the solution to wage problems.

Although legislative, union, personnel and economic trends have developed, partially at least, contrary to the theses of Mr. Cox, many employers have maintained them as their basic philosophy. However, it must be recognized that certain facets of this philosophy have wide acceptance and are based on facts that yield legitimate conclusions. One of these is the relationship of productivity to standard of living.

Introduction of Other Types of Job Evaluation Plans.

Two other exponents of job evaluation (prior to 1940) but with different approaches, were J. D. Hopwood, and Eugene J. Benge, (the latter with Samuel L. H. Burk and Edward N. Hay). It will not be the purpose to analyze or describe these systems, but to indicate any unique contributions to, or trends in, the field of wage differentials presented therein.

Basically, the Factor Comparison System of Benge (6) utilizes the factor breakdown, or job characteristics, as do the so-called point systems—exemplified (with modifications)
by Lott (27). However, only four or five factors are used and the relative value of jobs are determined by job-to-job comparison, one factor at a time. Actual money rates are used to quantify the factors and job rankings under each factor. The use of "key" jobs - those with rates upon which a committee agrees as being currently correct - is a critical feature of the plan. The money rates are those of the "key" jobs, and all other jobs are compared with these. Thus we find the objectives the same, and the methodology similar, in both Factor Comparison and point systems.

The plan proposed by Hopwood (23) is essentially a classification plan, based on careful job specifications and descriptions of general functions and responsibilities at respective levels of organization. The jobs are "classed" according to type of work and level by comparing the specification with the type and level description. A systematic series of dollar rate ranges and wage brackets quantifies this basically qualitative approach.

Besides Lott's first report, the Industrial Management Society's Occupational Rating Plan (34), was one of the earlier Point Plans to receive widespread notice, and was published in 1937. Thus, by 1940 the pattern had been established from the standpoint of application and methodology by four types of plan:

Classification
Factor Comparisons
Point System
Ranking

The fourth method listed, Ranking, is the simplest method (actually not a "plan"), and undoubtedly the oldest, since any wage structure with differentials between jobs requires relative alignment of jobs. The process is usually a qualitative comparison and arrangement of jobs, frequently by departments, and then by larger organizational units. Jobs then are assigned to wage brackets to form the rate structure. However, in this procedure as in all others, the job specification is essential to a basic understanding of the jobs. The simple ranking schemes do not seem to have any "champion" such as Lott; Benge, Burke, and Hay; Civil Service, and others who have developed particular plans. However, it does occupy an important place in job evaluation as a fundamental way of thinking about job relationships, although, as will be shown later it lacks the precision and objectivity claimed for the other plans.

Summary of Wage Practices. A study reported in 1937 (Wage Determination by John W. Riegel, of the University of Michigan Bureau of Industrial Relations) (88), gives an excellent summary of the philosophy and practices of job evaluation and related subjects prevailing in industry at that time. His survey of fifteen companies, and conferences with a total of sixty (primarily large manufacturing and utility,
with some retail concerns, in the Midwest) reveals that all of the types of job evaluation plans — with modifications to meet local needs — were in use.

As a conclusion to this important period, it appears appropriate to review some of Riegel's observations as indicative of the advanced thinking of employers. It must be remembered that at this time, the C.I.O. was just being organized, and many of the companies included in the study (Carnegie - Illinois Steel Corporation, Firestone Tire and Rubber Company, Westinghouse Electric & Manufacturing Company, etc.) were to be subject to considerable pressure regarding wages. However, as will be shown later, some of these C.I.O. unions negotiated agreements which included job evaluation plans of complex nature. Thus, the attitude of employers in 1936-37 is an important factor in understanding later developments.

Several situations had become prevalent in business and industry which might be classed as "causes" of job evaluation. Riegel summarizes this cause and effect relationship as follows:

Specialization of employments, indefinite occupational names, changes in occupations caused by technical progress, and the divided responsibility for managerial decisions regarding wages are conditions which complicate the determination of wage rates in medium-size and large business firms. . . . The representatives of the companies whose experience is the basis of this report asserted that they could not depend upon the labor
market' to indicate the solutions to many of their wage problems. They stated that their firms had to establish definite controls to keep wage structures consistent and equitable throughout. (88, p. 2)

Here is found a general desire or policy on the part of management to maintain consistency and equitableness in their wage structures. Another policy universally accepted was that of "paying for any service at least the average of prevailing rates for that service in its locality." (88, p. 2)

To carry out this policy, each company according to Riegel:

... Selects those services in its organization, which also are in general demand in the locality. It endeavors periodically to determine the prevailing local rates for these services. The averages or figures above the averages of these prevailing rates become basing points for its entire wage scale. Each firm also analyses and grades all its occupations, the key services included. In this way it tries to derive values for each specialized job which is not valued in the labor market. (33, p. 2)

Companies did not believe a "rational approach" to their wage problems to be a cure-all or without defects, but a method to assist in implementing the policies stated above.

The purposes, closely related to policy, of this type of wage administration, were several:

1. Payment of a uniform wage for the same services, regardless of location in the company organization, within a given locality.

2. Attraction and retention of desirable employees.

3. Prevention of paying "excessive rates."
4. Careful comparison, analysis of duties and job characteristics, and minimization of "bias and prejudice in classifying jobs for purpose of compensation."

5. Regarding jobs when duties, responsibilities and/or working conditions are changed.

6. Establishment of a wage scale that will be an incentive to employees to seek promotion to higher grades.

7. Although not a part of job evaluation, provide merit rating as an important adjunct to wage administration.

8. Increase executives' participation, in and ability to deal with, wage problems.

9. "Promote rational methods of adjusting wage issues."

Wage surveys constituted a major function of all companies included in Riegel's report. An illustration of the type of data included in a wage survey is shown in Table XX, Appendix D, reproduced from Wage Determination (88, p. 6). It was not indicated whether the rates were average, starting, or median, but for illustrative purpose they can be taken as "typical." This small sample cannot be said to be representative of the entire country, industry, or state, but is indicative of the type of information employers may use in connection with wage administration. According to
Riegel, the companies contacted were well aware of the deficiencies and shortcomings of wage surveys, and only attempted to secure data for "key" jobs which were widespread in the local labor market. The results of such surveys then were used to guide the development and adjustment of the individual companies' rate structure.

Negotiations regarding wage levels with representatives of the employees did not follow any consistent pattern in the companies included in Riegel's sample. In some cases no official representatives were recognized by management. In others, a union committee continually dealt with the company on policy and details of the job evaluation program. The amount and type of wage survey data revealed by management to the employees or their representatives varied considerably. The whole problem of the role and nature of labor agreements or contracts, especially in connection with changes in the rate structure, which seems to be dictated by economic conditions, was confused in 1936. Frequent review of the wage situation, either by management or by joint action with employee representatives, enabled many companies to maintain an "evolutionary process" and wage rates that are "satisfactory in high degree to both employers and employees."

Riegel sums up this phase of the problem by saying:

An industrial organization becomes complex, methods of wage determination should become more rational, so that they establish standards of
judgment usable by both employers and employees. A number of companies have found that the use of rational methods has increased the ability of their executives and their employees to determine basic wage rates which are mutually acceptable. (83, p. 29)

In connection with job evaluation itself, Riegel describes the types of plans, job characteristics, development of wage scales, ranges, conversions from evaluation points to wage rates, and other problems of technique as practiced by individual companies. As mentioned above, these followed the general types found in organizations and are discussed elsewhere. However, the basic considerations underlying the plans are most ably stated by Riegel as follows:

Prevailing rates exist only for common occupations. In the organizations visited, the majority of the occupations were highly specialized. For most of those occupations, there was a limited market - that is to say, there were only a few buyers of the services in the locality. The companies had to value the services on the basis of the values for related services for which a broader market existed.

To value specialized services not commonly employed, a method of grading or scaling work is necessary. Both employers and employees need reasonable standards of judgment which will enable them to graduate the compensation for these occupations above or below the standard rates for related services in common demand.

Thirteen of the companies visited, in dealing with this phase of wage determination, have sought to identify characteristics of work which correlate with the wages paid for such common services in their localities. They logically infer that the same characteristics can indicate values for highly specialized services, for which there is a limited market.
The companies have identified a number of occupational characteristics which they consider significant from this standpoint. They prefer to use objective characteristics as standards of reference, even though they recognize that human effort is compensated by wages. The objective characteristics have an important advantage, as standards of reference, in that they can be discussed without the complicating influence of particular personal consideration which temporarily may be involved in given work situations. (88, p. 30)

In the above statement is found a significant recognition of one of the fundamental postulates of job evaluation, i.e., job evaluation must provide a basis for "reasonable standards of judgment" for use, not only by employers, but also by employees, in structuring wage rates.

Another observation of general import in relation to various types of plans and their use is made by Riegel when he states:

The suggestion is advanced that the grading method may be preferable to the numerical rating method when systematic valuation of services is first attempted in a company. The users of both methods must define occupational terms and sharpen their perception of the differences between occupations which influence wages, but the grading method does not crystallize decisions to the degree that a rating plan does. The grading method requires the review and discussion of earlier decisions when new or changed occupations are classified for compensation purposes. It is evolutionary in nature and it improves with use. Its processes can be made more precise by the use of numerical ratings whenever its users are qualified for that further step. (88, p. 99)

Riegel's concluding chapter is entitled, "Social Significance of Wage Determination." Considering the fact that
his contacts pertaining to the survey and report were primarily with the managements of large, progressive companies, the conclusions are relatively objective. Some of these conclusions do reflect a tendency to eulogize management's role and motives. (E.g., "From a social standpoint, able management is to be encouraged as that agent of society which is responsible for dividing ways whereby the national income of goods and services can be improved and increased." (88, p. 121)) His reference to labor unions (but not employees, per se) are primarily in terms of "pressure groups," or in such statements as ". . . excessive wage rates exacted by labor organizations are socially disadvantageous." (88, p. 121)

However, his statement regarding wage differentials strikes a fundamental note, and probably reflects the best advanced thinking on the matter. It reads as follows:

Wage differentials are needed to induce individuals to prepare for and fulfill exacting types of work. The companies recognize, however, that wage differences are important sources of satisfaction and dissatisfaction among employees. An employee is favorably actuated by a wage rate which, according to his standards of judgment, seems to be equitable when compared with the payments received by other employees in comparable work. Wage determination is of social significance; therefore, because it influences the cooperation of millions of employees in production and conditions their personal satisfaction in their work relationships. (88, p. 118)

Riegel has two more statements which ably summarize the wage differential problem and attitudes as they existed at
the close of this period: 1920-1940. These statements are as follows:

Under the system of private enterprise, employees are assembled for work by persons in control of capital. This mobilization is accomplished by the wage system. The wage system is a characteristic of a society of workers who contract in their own right. The system is complicated in the degree that the society adopts the division of labor principle.

The function of the wage system, from the social standpoint, is to guide the distribution of the working population into socially desired employments. Furthermore, the wage system, together with capable and just supervision, should induce employees to put forth their efforts in the collaborative production of the goods and services needed for the maintenance and the elevation of the standard of living of the people. (88, p. 128)

Under the system of private enterprise, employers and employees rarely have regarded the general welfare in their wage negotiations. Yet their methods of negotiation and the terms they have agreed upon have influenced the economic condition of the whole society. The eclipse of common interest by partisan interest in the system of private enterprise is one of the serious dangers of that system. That this danger be reduced is essential. In wage determination it is being reduced by some employers and employees with wide vision, thoughtful approach, tempered partisanship, and constructive purpose. To these men the social significance of wage determination is clear. They see that methods of wage negotiation and the relationships of wage and price levels can help to maintain economic balance and promote economic progress. (88, p. 132)

It is of interest and importance to note that Riegel does not attempt to impute scientific accuracy, methodology or other implication that wage determination is "scientific." Rather he prefers to use the term "rational," indicating a
reasonable, intelligent, logical approach to the problem. This is not to say that "science" is not a reasonable, intelligent, logical concept and way of thinking, but, that there is the danger of inverse logic, of saying that a rational approach is also scientific. Science is something more than rational. Neither is this to imply that the sciences or the scientific method having nothing to contribute to job evaluation. However, the sciences most directly concerned are psychology and sociology, and more specifically industrial psychology (including applied psychology) and industrial sociology. The development, contribution, and analysis of these two disciplines are discussed in detail in Chapter VII.

During this period of the twenties and thirties, most of the job evaluation "plans" were formulated, although some were not published until later. Of particular importance was the plan developed by A. L. Kress, which was adopted by the National Electrical Manufacturers Association, (83, 79) and the National Metal Trades Association. These were "Point" type plans and are the most widely used, and will receive major attention in later sections. However, in 1937 Kress listed several "principles," recorded by Lytle (38)¹ as follows:

Where job rating is used, the following principles should be kept in mind: (1) rate the job and not the man. The requirements of the job are usually

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¹ From N.E.M.A. Industrial Relations Bulletin No. 43.
definite and fixed. ... a job rating plan should not be confused with any plan to grade employees. ... Each element should therefore be rated on the basis of what the job itself requires.

(2) The elements selected for rating purposes should be easily explainable in terms that will avoid any overlapping which might lead to rating the same qualifications under several headings. The elements should be as few in number as will cover the necessary requisites for every job.

(3) Success with job rating is absolutely dependent on a uniformity of understanding with regard to the definitions of the elements and on consistency in the selection of the degrees of those elements.

(4) Any job rating plan must be sold to foremen and employees. Success in selling it will depend on a clean-cut explanation and illustration of the plan.

(5) Foremen should participate in the rating of jobs in their own departments.

(6) The greatest degree of cooperation from employees, in job rating, will be achieved where they themselves have an opportunity to discuss the ratings.

(7) In talking to foremen and employees avoid discussion of money values. Talk point values with degrees of each element. Discussion of money values will lead to juggling.

(8) Too many occupational wages (or rate ranges for given labor grade) should not be established. It would be unwise to adopt an occupational wage for each total of point value. (28, p. 46-7)

A complete census of firms using job evaluation, and the various aspects of the problem is not available for this period, but Lytle (28) reports a limited survey in which 32 of 63 companies questioned were performing job evaluation of some sort. The method of sampling, the extent of the companies' use, types of plans, union participation, etc. was
not indicated, thus all we can conclude is that by 1938 some companies were using job evaluation.

Thus, by 1940 the pattern was set, and the problems of wage equity and differentials that resulted from the industrial effort of World War II, and post-war adjustments were to put job evaluations to a thorough testing. Scientists, technicians, and "experts," from several related fields were making contributions (1) to a better understanding of work requirements and human abilities, (2) to the total, or social, environment and its effect on work and job satisfaction, and (3) to the philosophy, principles and procedures for solving problems of the complex inter-relations involved in wage determination.

IX. THE CURRENT PERIOD (1940-1954)

World War II. The impact of World War II had a remarkably accelerating effect on job evaluation. The economic forces created by demands for war goods, the reduced labor supply, the shortages of materials and equipment in certain industries, the new technologies developing, plus the controls instituted by the Government produced exaggerated pressures on the wage structure of practically every business.

During 1940, 1941, and part of 1942, wages were not subject to controls. Major defense industries gradually pushed wages up in order to attract desirable workers, and
consequently so-called "low-wage" industries had to follow suit to retain their personnel. Two methods were available to increase hourly earnings: base rate increases and institution of wage incentive or bonus systems. In Emergency Management of the National Economy—Volume II (18), it is stated that:

Except in isolated areas, employers were increasingly forced to bid up labor prices in order to retain their personnel. This was especially true in low-wage industries. Labor preferred basic rate increases to bonus or incentive schemes because they might prove more lasting in benefit. The general, uniform (industry-wide) rate increase, the 'cents-per-hour' increase, and the leader-follower relationship predominated in industrial wage policies. This tendency created a problem for both government and industry; it made difficult the adjustment of wages in individual firms on the merits of particular cases. However, it appears to have been an inevitable result of the power of organized labor and of the war-time seller's market. (18, p. 202)

By April, 1942, the situation required government action in order to achieve some degree of stabilization of the economy, and the President delivered his Seven-Point Message which included wage stabilization as one of the principal points. The implementation of this item was limited to special cases such as the Little Steel formula, and in October of 1942 the President established the Office of Economic Stabilization and designated the War Labor Board to

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1 "In July the Little Steel formula limited wage rate increases, except to the extent that they had lagged behind the 15 per cent increase in the cost of living from January, 1941 to May, 1942." (18)
administer wage stabilization. The Director of Economic Stabilization promptly (October 25, 1942) issued regulations establishing the program. The basis then for stabilization of wages was as follows:

Pursuant to the Board guidance given them, the NWLB and Commissioner of Internal Revenue provided for adjustments above or below the rates of wages and salaries existing on 17 September, 1942. In accordance with its orders, the War Labor Board made exceptions to the general rule of stabilization in cases involving:

1. Maladjustment of wages to the cost of living according to the Little Steel formula, allowing increases up to 15 per cent over January, 1941 wage rates. This adjustment was thought necessary in the interest of equity, and harmless because most wage rates had already risen 15 per cent or more by May, 1942.

2. "Gross inequity" arising from differentials between comparable plants, and/or occupations in the same plant, in a local labor market (using 'sound and tested' or 'going' rates, and a system of 'brackets' or maximum and minimum rates). This criterion was formulated by the Director of Economic Stabilization in May, 1943, to ameliorate the condition caused by the President's Hold-the-Line Order which had first seemed to forbid all adjustments due to inequalities and inequities. The majority of increases approved were to correct such inequities.

3. Automatic increases (without prior approval) for occupations paying less than a minimum (first 40, later 50, still later 55 cents per hour).

4. Upgrading and reclassification of personnel, incentive wages and premiums for extra shifts, vacation allowances and bonus, where no increases in prices would result. These could
be made, within limits, without specific Board approval. (18, p. 205)

Thus, one of the major problems of wage and salary stabilization -- an integral part of national economic stabilization -- was centered around "gross inequities" in wage differentials. The fact that a "majority of increases approved were to correct such inequities" is significant. Table VIII below shows statistically the extent of the National War Labor Board activities in cases involving wage adjustments:

**TABLE VIII**

Disputes in Which Wage Adjustments Were Ordered
(January 12, 1942 - August 18, 1945)

<table>
<thead>
<tr>
<th>Cases</th>
<th>Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>Percent</td>
</tr>
<tr>
<td>Maladjustments</td>
<td>478</td>
</tr>
<tr>
<td>Substandard</td>
<td>539</td>
</tr>
<tr>
<td>Gross Inequities (inter-plant)</td>
<td>3,734</td>
</tr>
<tr>
<td>Intraplant Inequities</td>
<td>733</td>
</tr>
<tr>
<td>Other adjustments</td>
<td>1,694</td>
</tr>
</tbody>
</table>

| Total | 7,183 | 100.0 | 1,066,997 | 100.0 |

The preponderance of "inequities" cases is seen from this tabulation. Job evaluation was directly or indirectly connected with the cases and decisions involving the two inequities classes. In inter-plant cases, wage surveys and

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The principle of 'gross inequities' was designed to correct faulty relationships between wage rates within the confines of the wage ceiling.

Between October 3, 1942 and April 8, 1943, the War Labor Board dealt with inequitable relations between wage rates on the basis of the 'inequalities' doctrine. This did not mean equalization between all rates for similar work in different plants. The Board appreciated that in many cases differences between rates were based on 'historical' factors - such as the location of plants, the relative pleasantness of working conditions, and the extent of unionization. However, it did allow equalization or the approximate equalization of rates for similar work where no compelling 'historical' factor was present to explain the differences. When the wage line was tightened in the spring of 1943, the doctrine of 'inequalities' was replaced by the so-called 'bracket system'. Under this system, as earlier noted, the Board was authorized to establish rates for the main occupations or job classifications in a given labor market area and was permitted to approve increases in rates up to the bracket minimum for the jobs.

Approvable bracket-minimum rates were established by the Regional War Labor Boards for major job classifications in most of the industries and labor market areas of the country. Only the major or key classifications were given approvable rates because it was physically impossible to set such rates for the thousands upon thousands of job classifications in American industry. It was felt that 'on the basis of the rates found to exist for the key jobs in each industry and area, it would be relatively easy to figure out what the remaining job rates should be because of established and known inter-job relationships.

Each approvable bracket-minimum rate was set by representatives of labor, management and the
public who were familiar with local job and wage rate conditions and who had at their command a large quantity of wage and job data collected by the United States Bureau of Labor Statistics, employer's associations, unions, and other sources. Various methods were used in calculating the proper approvable rates, but they need not be discussed here. As a general rule, the approvable rate was about 10 per cent below the weighted average of rates paid by all employers in the industry in the area for a given job classification.

If a plant wished to increase rates for many job classifications, complications might be introduced. On the one hand, rates ordinarily could not be increased above the approvable rate for each job. On the other hand, a plant did not ordinarily want to give increases which would upset the normal relationship between rates for different jobs. When all of the existing rates were below the approvable rates, relatively little trouble was met, although some difficulty existed if certain rates were further away from their approvable rates than others and it was not felt desirable to give some workers larger increases than others. Matters became still more complicated when some of the rates were below the approvable rate and some were already above.

There was no simple answer to these difficult questions. It was necessary for the Boards to work out, with the help of the employer and the union, a rate-adjustment schedule which would keep rates for the different jobs in balance and at the same time not exceed the approvable rates for the jobs. (57, pp. 166-8)

The question of inter-plant inequalities presented problems peculiar to the war-time emergency, when the over-all consideration of economic stabilization predominated. However, intra-plant inequalities is exactly the type of situation faced in normal as well as emergency times by all plants and businesses. The war accentuated the seriousness of the problem and also did much to accelerate the use of job
evaluation. This phase of war-time industry is of particular interest in light of the subject and purpose of this thesis, and it is therefore appropriate to examine intraplant inequities in some detail.

The general policy of the National War Labor Board was to support the theory of "equal pay for equal work," and issued regulations concerning non-discrimination in the cases of women employees, non-white workers, etc. The over-all policy in regard to wage structures was to withhold permission for employers (with more than 30 employees) to give individual wage increases unless the company had a formal, adequate job classification schedule. "A proper job classification schedule" meant, according to the Yearbook of American Labor (57): "(1) a system of job classifications with either single rates or ranges for each classification, and (2) a plan for an orderly and definite procedure for making individual wage adjustments either within the job classification or between job classification. A proper plan was one which included certain definite tests for rules to determine whether and when an employee was entitled to an individual rate adjustment, and also included certain rules as to the number and amount of increases which an individual might get. If a plan was part of a collective bargaining or other bona-fide agreement as of June 30, 1943, or could be shown to have existed by written statements, minutes, or memoranda of an
employer on or before June 30, 1943, or was approved by the War Labor Board; no further Board approval was required. If no proper plan existed, the employer could submit one of his own to the Board for approval or could use a plan prepared by the Board without obtaining further approval.

Such a policy forced many companies to adopt job evaluation plans and also to bargain collectively regarding the operation of the plan. Unions were generally favorable toward these job evaluation plans because "they wanted to get increases through any means."

Many of the cases wherein individual wage increases or reclassifications were requested, were returned by the Board to the companies for action by collective bargaining under one of the following terms:

1. No instructions as to procedure.
2. Instructions to establish a Job Evaluation Committee and/or have technical advisors develop the program.
3. Permitted use of a partial or a general wage increase as part of job classification increases.
4. Set up the following (and other) "guide posts":
   a. Define jobs simply and concisely.
   b. Place jobs in proper relationship.

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1 Barkin, Solomon, "Wage Determination: Trick or Technique" in Gomberg, William, A Labor Union on Job Evaluation. (20)
c. Reduce classifications to smallest number practical by grouping substantially similar jobs.

d. Establish wages, rates within certain limits set by the Board; or by using rates of comparable jobs in other plants, within certain limits.

3. Establish wage rates for key jobs; and use such criteria as:
   (1) No individual's pay rate will be lowered as the result of job evaluation.
   (2) Historical relationships will be maintained.
   (3) Nature of work will be considered.
   (4) Equal pay for equal work, etc.

In connection with classification, or reclassification, of jobs, the stabilization policy was that as little as possible net increase in production costs was to result. Certain small limits were set by various Boards. The classification idea was that the jobs would be classified, and the pay rate incident to that classification was the pay rate, or rates, of the individuals so classified. Situations arose, of course, wherein some companies improperly classified individuals in grades above the actual skills and responsibilities involved, in order to get increases for these employees. This was not an inherent fault of the system, but a lack of ethics on the
part of employers and employees.

The Termination Report of the Board (46) cites a memorandum, dated May 11, 1945, which dealt with reclassifications as follows:

1. Such wage adjustments shall not affect a general, across-the-board wage increase. That is, increases to all jobs involved - beyond those permissible under the Little Steel Formula, substandards, or the bracket system - shall not be granted. In job reclassification cases, a significant proportion of those decided by the Board and its agencies has resulted in no net increase in job rates.

2. In such cases, two or more key jobs representing different levels of skill and containing substantial numbers of employees shall be selected as anchor points. The other job rates shall be set in proper alignment and relation to the anchor points so as to achieve a balanced and national internal rate structure. Such an alignment shall normally result in some job rate increases and some job rate decreases.

3. . . . .

(a) Most job reclassifications can be effected without any net increase in job rates. . .

(b) The real limitations, . . are the equities involved in the adjustments themselves. Board agencies shall, within the limitations compelled by the extent of technical knowledge and engineering assistance available to them, judge the merits of job reclassification plans with respect to whether or not inequities have actually been in existence and whether or not the proposed grading and slotting of jobs and employees removes inequities. (46, p. 242-3)

In some cases the War Labor Board considered the details of job evaluation plans and made specific comments and recommendations. An example of an existing plan which the Board did not approve is given in the case of the Reynolds.
Wire Company (Case No. 4200-CS-D, July 5, 1945) wherein the Board stated that in its opinion, the company,

... has thus far determined its wage rates unilaterally on the basis of a complex job evaluation plan. This method of determining wage rates is one of the sources of difficulties with the union. Had it made its adjustments through collective bargaining it is quite likely that the case would never have risen. The company now has in excess of 100 job classifications, each with a separate point rating in its job evaluating plan, although it has only a little more than 550 employees. (46, p. 246)

Generally the Board favored a classification or factor comparison type of plan over a point-rating plan, because the former types lent themselves better to problems of inter-plant and bracket adjustment of wages, than the point systems. However, a point type plan was acceptable to the Board provided it met the criteria referred to above.

The general attitude and conclusions of the National War Labor Board are best expressed in the following excerpts from the Termination Report. The first is by Dr. George W. Taylor (then Chairman of the NWLB) and is taken from an address before the American Management Association, April 11, 1945:

One of the most striking impressions I have of American wage-rate structures is a failure of a large part of industry to develop properly aligned wage schedules in the plants - with jobs defined, rates standard for these classifications and rates for particular jobs compensating with reasonable accuracy for the skill involved. Too many wage scales have what I call 'random rates' based not on the job but on the individual. I think a great task before a large part of American industry - certainly the mass production industries - is to
work out rational wage structures which provide a
definite rate structure for definite jobs. (46,
p. 243)

The other excerpt is from the "Wage Report to the Pres-
ident of the Wartime Relationship of Wages to the Cost of
Living" by the public members of the Board, and is as follows:

The wage rate structures of many companies
have been developed in a haphazard manner. Dif-
fering rates are frequently paid to workers who
may in fact be doing the same job with the same
degree of efficiency. In addition, established
wage rates for different jobs are often not set
in proper relationship to required differences in
skill and ability. The Board has found that ine-
equitable wage rate relationships invariably im-
pair the morale of workers and lead to grievances
and disputes. (46, p. 243)

Although the War Labor Board "settled" cases relating
to job rate inequities on a reasonably rational basis, and
certainly helped to contain the inflationary pressures by
curtailing wage increases, the program was not achieved
without some disadvantages accruing to the over-all concept
of job evaluation. In the first place, both companies and
unions used job evaluation plans as an expedient to secure
short term objectives, and in many instances failed to de-
velop a sound plan. No data is available, but numerous cases

1 Bureau of Labor Statistics Average Hourly Earning
Indexes for Production Workers in Industry (1939 = 100):
1941 - 110.9  1946 - 166.0  1951 - 242.7
1942 - 127.2  1947 - 189.3
1943 - 141.2  1948 - 207.0
1944 - 149.6  1949 - 216.0
1945 - 152.1  1950 - 223.5
Sources: Statistical Abstract of U.S. (89)
are known where companies abandoned job evaluation plans shortly after the war. Solomon Barkin, whose article "Wage Determination: Trick or Technique" appears in Gomberg's Manual on Job Evaluation (20), points some of the views of unions regarding war-time and post-war job evaluation:

...Since the formal job evaluation programs were given approval by the War Labor Board, the unions quickly assented to them. Although the Board tested these plans primarily in terms of going [rates], which were not looked upon favorably by organized labor, trade unions frequently were willing to secure whatever advantages they could from these programs since collective bargaining could not itself correct these programs. As a result, these plans were more readily accepted than would ordinarily have been expected...

The reconversion period has increasingly brought to light many problems which were overlooked during the war period; when unions were eager to get wage increases. Trade unions which have had experience with these programs are now more sensitive to the internal deficiencies of the plans. Management expected to employ the systems to depress wage rates in the reconversion period but has avoided doing so in the great majority of cases because of the emphasis on general wage increases. But the limitations of these job evaluations programs for collective bargaining are already beginning to show up. Trade unions are increasingly attempting to unshackle themselves of these plans, wherever they have been written in the contract. (20, p. 63-4)

One of the specific points causing dissatisfaction with wartime wage rate determinations was the use of the prevailing bracket rate principle by the Board. The pressure of time and inadequacy of trained personnel obviously resulted in assigning rates to key jobs and brackets that were not completely satisfactory to all parties. The very difficult
problem of wage surveys, particularly in a time of rapidly moving events and changes in industry, caused rates to be established on insufficient or inaccurate data. In certain cases the Board members were not technically qualified to judge the true merits or faults of a proposed job evaluation and rate program. If the union representatives were likewise unaware of the real import of the plan, the company could get a classification plan approved with little difficulty, even though it was a hastily and poorly conceived one.

The situation just described also included the emergence of a large number of "management consultants" offering their services to industry for installation of job evaluation programs. Enough of these consultants developed plans that were not satisfactory to all parties, to cause a number of both unions and managements to look with disfavor on formal job evaluation.

Post-War Developments. Three rather important and general developments made rapid progress during and since the war that portend significant consequences in the field of wage determination and differentials. These overlap and reinforce each other, but constitute three trends that mark this current period, and they are:

1. Statistical analysis and use of statistical tools in various phases of job evaluation.
2. Research, by universities, companies, and others into the basic concepts and problems of job evaluation.

3. Collection and dissemination of more accurate and complete information regarding job content, wage rates, and other wage data for closer comparison of company and union practices.

A fourth item might be added, and that is the increased participation by unions in the programs of individual companies, and the more frequent inclusion of provisions in union-company agreements regarding the details of job evaluation and classification.

As in all phenomena that are used to distinguish historical periods, the above mentioned developments will be found in varying degrees in any particular organization. For example, obviously not all universities have attempted research in job evaluation, but the few that have can be considered as making a contribution, and one rather unique to the period following 1940.

Another important development to have a general effect on applied job evaluation was the establishment of the Wage Stabilization Board in December, 1950 and the Salary Stabilization Board in May, 1951. These Boards were created under the authority of the Defense Production Act of 1950, and

\[1\] Actually sworn in July 10, 1951.
report to the Economic Stabilization Agency. The Wage Stabilization Board deals with hourly paid employees and those salaried employees who are represented by a labor union. The Salary Stabilization Board is cognizant of so-called "exempt" employees - those not covered by the Wage-Hour Law, such as administrative, professional, executive employees (i.e., salaried) and outside salesmen.

The basis of operation of the wage and salary stabilization plan was the "freeze" on all wages and salaries as of January 25, 1951. Companies (or other employers) since that date have brought their cases for wage and salary adjustments to the Boards to secure relief. A basic point in the entire program is that the regulations issued by the Boards do not refer to the employee, but to the rate of pay for the job. The Boards recognize any wage increases given by a company which is in accordance with a plan (classification, bracket, or other type job evaluation plan), in effect on the freeze date - January 25, 1951 - or that had been approved by the Board subsequently. Dr. Joseph D. Cooper, Executive Director, Office of Salary Stabilization outlines (60) the requirements for new or modified salary plans as follows:

The plan submitted to the Office of Salary Stabilization must include: (1) a description of each position or classification; (2) the grouping of positions into grades, if any; (3) salary range for each position or classification; (4) specified limits for increases; and (5) the time or times for review for the purpose of merit or
length of service increases. The Office of Salary Stabilization is authorized to approve new salary plans or modifications of existing salary plans in the light of the employer's past practice and of relevant practice in the industry, occupation, or area, as may be appropriate. Adequate data in support of the application must be submitted by the applicant. (60, p. 74)

Essentially the same rules apply to wage plans for submission to the Wage Stabilization Board. The important point is, that in so far as payroll is concerned in national economic stabilization, the principles of formal job evaluation plans are recognized by governmental agencies as being a sound basis for:

1. (Maintaining) historical relationships between salaries and wages, and to assure equal treatment for all.

2. (Preserving) the basic salary policies which enable business to operate as flexibly as possible, with a minimum need for submission of petitions for rulings on cases of individual employees.

3. (Preserving) the incentive system, which is the root of the American system of free enterprise, consistent with the needs of economic stabilization. (60, p. 75)

It is interesting to note, for example, that, as Dr. Cooper explains: "If a company uses the personal or random method of payment, an employee may be promoted or transferred to a higher-paid position and increased to a salary corresponding to his ability and experience. However, such a salary cannot be above the highest salary paid to the employee having the most nearly comparable duties and responsi-
bilities, as established by company records." (60, p. 74)
Thus, even without a formal job evaluation program, the com-
pany must justify its wage adjustments on the basis of
records of "duties and responsibilities," and their compar-
ability.

Review of Historical Developments. Up to this point, the presentation of the historical development of wage differen-
tials has been primarily factual, in-so-far as the authorities cited are factual, and some effort has been made to indicate relationships of past developments, philosophies and ideas to the present situation. It appears appropriate then to review, and perhaps distill, some of the findings previously presented.

First, an analysis of the charts in Appendix C relating to wage trends and differentials will reveal certain general characteristics. One of these is that there always (since work had any economic significance) have been differences in the compensation for labor of varying types. For many cen-
turies, (in fact even today except in highly industrialized countries), the so-called "common laborer" performed the great bulk of work, since production and construction relied on man and animal power rather than mechanical power. This was the heavy physical labor found in nearly all forms of endeavor, and consequently was considered roughly equal, and the laborer's wages were therefore roughly equal, and gener-
ally equated to the subsistence level of the cost of living scale. The effect of slave labor, not uncommon throughout most of history, was also a noticeable factor in maintaining this general low rate. The attitude of influential groups toward menial work also affects this situation. The artisan, one skilled in producing useful and beautiful articles, based his earnings (pay) on what he could sell his product for, since he dealt directly with the customer. Tradition, supply and demand, and other factors entered this relationship, and of course, is one that exists even today in many forms of enterprise, where a few people or even one person, constitute the "company."

However, the "Industrial Revolution" upset these rather simple arrangements, and today very complex wage structures are found in industrial societies. Division of labor has been recognized as a fact for many centuries, but the classical concept of division of labor was one of occupational division. The highly integrated but complex organization of individual units of work performed in modern industry, reveal not only an occupational division of labor, but a further breakdown into operational division of labor. This presented problems not previously encountered in the simpler forms of production. One result of the increased use of power and the division of labor concept just referred to, is the virtual disappearance of "common labor" as a classification
in many industries, particularly the mass production industries. The work performed by "common laborers" has been assigned to "material handlers," "sweepers," "helpers" of various types, "janitors" and class "C" (of three classes) workers in certain occupations such as "assembler." However, in the construction industry "common laborer" remains in both name and fact. Whereas, previously, in the handicraft and guild form of industry, three classifications of workers, (apprentice, journeyman and master) were sufficient for any one enterprise (that is, in one trade), the number has increased to as many as 354 recognized job classifications in one company which manufactures a rather specialized product.

Another phenomena that can be viewed over a reasonably long period, and has significance today, in the relative differential in wages between skilled and unskilled labor. This has been mentioned previously in connection with Charts Number 1 and 2. At the turn of the century a common differential was about 100%, whereas this figured has dropped to approximately 50% today. This whole problem in connection with job evaluation will be discussed in more detail at a later point.

It was indicated above that job evaluation developed for a number of reasons, one of which was the growing attitude and method of thinking related to the scientific approach to problems. One can find a number of parallel situations in job evaluation and the methods of science. However, although
the exponents of some plans, particularly the "point" types; refer to their techniques in terms of "scientific," it is presumptuous to state (with exceptions, one of which is discussed in Chapter VII) that any job evaluation plan or installation is scientific or was developed by use of scientific principles. This, however, does not mean that those procedures and methods utilized by the sciences in carrying out researches, etc., and which logically and economically can apply, should not be utilized (even in modified form) to attack the problems of job evaluation, both in conceiving and analyzing basic concepts, and in the installation and operation of specific plans for a specific organization.
CHAPTER III

PRINCIPLES AND FUNDAMENTAL CHARACTERISTICS

Job Evaluation primarily is a technique, a procedure, a "tool," used by management (although not restricted to such use) to establish a classification of, and logical relationship between, jobs within a given organization. Just as in the case of most techniques, there is a wide variety of specific ways in which the ultimate goal can be achieved. Also, as with most techniques, a number of by-products and ancillary uses are found to result from the carrying out of the technique. Underlying this multitude of procedures, are certain principles and characteristics which should be recognized and analyzed in order to understand the outward evidences of job evaluation.

I. BASIC ASSUMPTIONS

R. C. Rogers, writing in the Journal of Applied Psychology (70) has set forth some of the basic assumptions of job evaluation as follows:

Underlying most of the existing systems of job evaluation are the assumptions (a) that the job evaluation plan provides measures 'job' characteristics rather than 'employee' characteristics, (b) that each of the factors provides a discrete measure of some aspect of job worth and that they are capable of independent valuation, (c) that each of the factors bear a significant association with the total measure of job worth, (d) that each factor, is 'weighted' in proportion
to its unique contributions to the total evaluations, and (e) that the plan includes all or most of the significant 'common denominators' of job worth. (70, p. 579)

In addition to the items listed by Rogers above, there must be included the assumption that the job evaluation procedure will produce reliable results, that is, the same job will be evaluated at the same value or rating (within one labor grade or similar limits) every time the evaluation process is repeated. It should be pointed out that the assumptions stated by Rogers apply mainly to the so-called "point" systems and factor comparison systems, and the assumption regarding weighted factors does not apply (except as an intuitive concept in the minds of the evaluators) in the ranking and classification systems. These various systems and the effects of the assumptions will be discussed in detail in this chapter.

As has been shown, job evaluation is the result of evolutionary process, the result of technological and social changes. It is also significant to observe that such a development not only took place in those countries and localities where industrial progress reached advanced stages, but also where a representative, democratic political environment prevailed. The many contributing forces, such as the sciences of psychology and sociology, economics, "scientific management," personnel administration, industrial engineering, labor organizations, and similar fields of knowledge and
activity, all were free to operate in such a manner that by coordinated efforts and interchange of ideas, techniques were developed which are mutually acceptable, with compromises, of course, to parties involved in the determining of such an important matter as wages and salaries. This is not to say that job evaluation techniques have reached a state of "perfection" or even that they are "correct," but that a type of procedure, which, to a degree, is an objective one, with the intended purpose of establishing equity and fairness in a situation that can be subjected to various ulterior pressures by the parties involved, was able to develop and gain acceptance in an increasing number of organizations.

Objectivity; Rating the Job, Not the Man. Job evaluation has to do with wages and salaries. Its concern with wages and salaries, however, is in a limited sense, and it does not propose to deal with all phases of wages and salaries. An understanding of the limitations and disadvantages of a job evaluation procedure is as important as an understanding of its scope and advantages. In the first place, only the job itself is considered. Objectivity is the basis for this limitation, but certain problems immediately arise. If a job is to be studied and analyzed apart from persons performing the job, certain unrealistic suppositions have to be made, and many people, (on evaluation committees, for example) have great difficulty in making this abstraction.
This objective approach, based on detailed descriptions of the job being compared with certain abstract factors (in some cases quantified), has led some proponents of systems to claim (unjustifiably) scientific accuracy for the results. This particular aspect of job evaluation will be treated in detail in another section. In spite of these, and other criticisms of job evaluation in relation to objectivity, this underlying characteristic must be recognized as a feature of job evaluation. The degree of objectivity varies considerably with systems and with any individual program. Of the four major systems, probably the following ranking—low to high—would be indicative of the degree of objectivity:

- Classification
- Ranking
- Factor Comparison
- Point

In any plan the objectivity can be increased by proper training of raters, and the data made more meaningful by proper statistical controls and analysis. Other ways to attain a higher degree of objectivity is to define terms, factors, etc., in definite form that eliminates or reduces the judgment required to interpret the terms, factors, etc. Nevertheless, judgment is an ever present and important element in job evaluation.

**General Criteria.** Although objectivity is a seemingly
desirable goal, there are certain phases of job evaluation that do not seem either to lend themselves to objective measurement, or from the human relations standpoint to be desirable. This brings up the fundamental questions: By what criteria do we judge or evaluate the principles, processes and results of job evaluation? Without such criteria, problems relating to objectivity versus human judgment, abstract factors by which rating is performed, etc., become confused and insoluble on any rational basis. The ultimate criterion for a job evaluation program is "an equitable and consistent wage structure;" or expressed another way, a program that is satisfactory or acceptable to both workers, supervisors and management. These criteria are pragmatic and require interpretation of such terms as "equitable," "consistent," "satisfactory," and "acceptable."

"Equitable" to the apportionment of the total payroll in such a manner that each employee receives wages or salary that represents his relative worth, or contribution to the company. (It should be pointed out, as an aside, that job evaluation makes no effort to enter the problem of the size of the total payroll, only its apportionment.) There are, as would be expected, a number of different views on this, from the view of the individual employee, the union, the immediate supervision, the top management, and even groups outside the plant, starting with employees' families, pros-
pective employees, or workers in other plants in the community, and the so-called "public." Obviously it is not going to be possible to reconcile the viewpoints of all these people as to what is equitable. Usually, the parties that have the most to do with the actual determination of rates (i.e., management and the union) must decide that the wage structure is equitable. Job evaluation has particular functions in the entire, continuing process of wage determination, and those are involved, among other things, in developing reasonably objective data which can be used as a guide to judgment. Thus the meeting of the criteria referred to above cannot be charged entirely to the job evaluation procedure. The more pertinent point is this: that there is (or, it can be expected that there will be) a contingency relationship or correlation between the degree of completeness and objectivity of the job evaluation procedure and the degree to which the criteria has been met.

The two concepts of "equitable" and "satisfactory," while used as being more or less synonymous, may in fact, have different connotations. It is presumed, though, that to avoid unprofitable excursions into the field of semantics, that a wage structure that is "equitable and consistent" is also "satisfactory," and "acceptable," especially as viewed by a given group or individual with a given organization. The term "consistent" lends itself to more specific interpre-
tation, and is probably the most "clear-cut" of the criteria by which wage structures can be judged. Under this concept falls the idea of "equal pay for equal work," generally an accepted principle of labor relations and wage administration, although historical sex differentials remain in certain instances. By establishing a systematic procedure with carefully defined standards by which to evaluate the various phases of jobs, reasonably close agreement can be reached in assigning equal rates to jobs with (theoretically) equivalent levels of difficulty, responsibility, or other abstract measures of job content.

One looks in vain (with a few limited exceptions) for attempts to measure the degree to which the above mentioned criteria can be or have been met. The questions of course arise, how would the hypotheses be stated, how would the measurements be conducted, and to what use could the results and conclusions be put? The last question, of course, is more important to the operating executive or union official, to whom job evaluation is a "tool," and if such an analysis will not furnish additional data of practical value, and at an economical cost, the first two questions, need not be considered. However, to those concerned with broader and theoretical aspects of the problem, the third question is of lesser importance. Hypotheses could be formulated regarding the equity of the wage structure of a given job evaluation.
program, by stating that (1) base rates developed thereby correctly represent the proportionate value of the jobs to the company, or that (2) the classification of jobs in grades meets with the approval or is acceptable to most employees. If the first hypothesis is examined, it will be realized that in most instances, the results of the job evaluation process itself are used to indicate non-rejection of the hypothesis. This, of course, is reasoning in a circle. It assumes that the entire process is completely objective, and that the standards (factors, degrees, ratings, etc.) are correctly quantified to yield such results. In spite of this difficulty, the very justification for job evaluation procedures is that their more objective approach yields a "better" (more equitable, consistent, defensible, etc.) wage structure than other methods.¹ Actually then, the underlying question is whether objective, systematic methods, adapted from the scientific approach, can be applied to wage determination to yield sounder results than illogical, unsystematic, random methods based on personal judgment or whim and pres-

¹ Otis and Leukart (35) list several types of, or reasons for, wage inequities: Favoritism - discrimination, demotion without reduction in pay, promotions without sufficient increase in pay, error in judging worth of job, aggressive foreman or department head, seniority - tenure, error in merit, timid or aggressive worker, inability to perform job, payment for something other than work, making the job look difficult or easy, more money or quit, union pressure, (lack of) equal pay for equal work (especially in relation to pay scales for women), minority groups, and physically handicapped workers.
sure bargaining. The concept of systematic methods is closely related to the scientific method from the standpoint of analysis and synthesis, development of quantitative measures or standards, orderly collection of pertinent data or facts, and drawing conclusions based on examination of these facts. If this approach is accepted as a postulate, then the theory of job evaluation is justified. As has been pointed out, there are deviations from objectivity wherein judgment plays an important part. Methods are available for the guidance and control of judgment so that biases are recognized and allowed for, and that errors of judgment will be minimized. Such methods, mainly developed by psychologists, and lately by contributions from sociologists, are especially useful in the developmental stages and initial installations of job evaluation programs. However, since ratings (judgments) by individuals and groups from the major part of the activity, the techniques for improving ratings are particularly important.

If the criterion of "satisfaction" or "acceptance" is examined, it will be recognized that this is more difficult to evaluate, since a person's satisfaction is influenced by many factors besides the one particular area (in this case the results of a job evaluation program) being measured. Satisfaction might be judged by such measures as number and nature of grievances, labor turnover, general agreement of
the union with the plan, etc. Again, these measures are subject to many influences, and it is difficult to know what part job evaluation (or lack of it) had in such phenomena. Recently, there has been much interest in job satisfaction as an area for research by psychologists and sociologists. The general conclusion of research in this area is that other factors are more important than wages. However, the same techniques used in conducting general job satisfaction research could be applied to testing the hypothesis that the employees and supervisors are more satisfied with the internal wage structure after a job evaluation program is installed, than before. Such a project should produce valuable data not only for management, but for those concerned with the fundamental issues of job evaluation. The contributions of psychology and sociology will be discussed in Chapter VII.

The existence of internal consistency probably can be verified more easily than such abstractions as satisfaction or equity. In the first phase, two separate methods, or independent groups using the same method can be used to evaluate jobs, and their differences compared. Lack of agreement on the same job(s) would indicate a deficiency in the procedure. Which procedure is the more nearly correct would have to be the result of additional tests. One piece of research which has a bearing on this phase of job evaluation is reported by Dr. C. H. Lawshe (64) in which five jobs
were re-evaluated twice, at intervals separated by several weeks. (See Chapter VII.)

Another basic wage policy adopted by many organizations is that of paying wages equal to, or better than the average or "going" rate in the community for comparable work. The implementation of this policy involves a market (labor) analysis or wage survey, which is discussed at length in Chapter IV, Economic Aspects of Job Evaluation. Provided such a survey yields accurate results, it can be used as an external criterion for the wage structure of a given organization. Frequently, surveys are not only used as criteria, but also the basis for establishing specific wage rates. This is true, for example, with the Army-Navy Wage Boards which use their wage surveys to establish rates for "blue collar" government jobs.

It should be pointed out that "comparability" of jobs is the key to proper use of wage survey data, and that an accurate determination of this characteristic is a difficult and tedious procedure where a large variety of jobs, or complex jobs, exist. It has been established that job titles are relatively meaningless, and summary job descriptions are often inconclusive for an adequate test of comparability. Only by an evaluation of actual jobs in other organizations, using the same evaluation techniques as in the given company, can a reasonably equivalent measure of a sample of community
jobs be established. Usually, a compromise between accuracy and cost has to be reached, and this compromise is largely a matter of judgment. The use of standard surveys—such as those conducted by a manufacturer's association, chamber of commerce, etc.—with job titles and/or brief descriptive matter, is economical, but not accurate from the standpoint of comparability. The evaluation of other companies' jobs is accurate, but costly. While the cost is relatively easy to determine, the degree of accuracy is not. A search of the literature fails to disclose any research on the relative accuracy of various types of wage survey techniques. Such articles as Mr. Belcher's on "The Place of the Wage Survey" (59) stress the need and means of achieving accuracy (principally by increasing the amount of detail information obtained, and careful selection of companies and jobs to be included in the sample), but again it is difficult to place any quantitative or statistical measure of accuracy on the results. This is not to say that wage survey results cannot or are not analyzed statistically, for the opposite is true. Further, the given company's wages and evaluations can be compared statistically with survey results, when the latter are accepted as the criterion. However, because of the many factors influencing community wages, and survey data, the use of such data as a criterion should be undertaken with caution and a thorough understanding of the nature of the data.
Accuracy of evaluations - or verification of reliability of ratings - can be determined, in addition to the methods referred to above, by a cross check in a number of ways. These are operational techniques, described in detail in such references as Otis and Leukart's, Job Evaluation (35). Such steps should be taken in any program to reveal errors and inconsistencies, or to reveal certain jobs that, for special reasons, do not fit the evaluation procedure and must be considered as exceptions, to be handled separately. The principal cross check is to group all jobs placed in the same level or degree, ratings of each factor, and determine by committee procedure, if the jobs do in fact fall at the same level. Since jobs were originally rated a job at a time for a number of factors (particularly in the point systems), the re-rating, factor by factor for a number of jobs, tends to eliminate (or reveal) biases and other errors.

Otis and Leukart (35) propose the following as "a practical method of determining the validity of the job differentials:

the number of pay grievances per year based upon inequities in relation to other jobs within the company becomes a measure of the validity of the job evaluation. (35, p. 302)

This approach of Otis and Leukart may be using in one sense - a negative sense - "satisfaction" as a criterion. It would certainly be poor administration to ignore such grievances as an indication of the degree of success and weaknesses
of the job evaluation program, but to use these grievances as the sole determinant of validity leaves much to be desired. One would be at a loss as to the application of statistical techniques in using this measure, other than to tabulate grievances by number, dollar value involved, etc., and decide at what points various degrees of "success" was indicated. Even so, the qualitative features of grievances often make one grievance more important in terms of eventual action taken than ten grievances of routine implications. Grievances often indicate more than the fact that the job evaluation system or its application was in error. Actually in certain cases, pay grievances of the type referred to by Otis and Leukart should not be charged to job evaluation at all, but to poor supervision, clerical error, union disagreement, individual maladjustment, etc. etc.

Job Characteristics. A fundamental concept in job evaluation, and closely related to that of evaluating the job, not the man, is the establishment of certain abstract characteristics of jobs which are used in the development of quantitative scales by which jobs can be "measured." The ranking method does not utilize this concept, but considers jobs in their entirety. Likewise, the classification method treats jobs as entities, but often uses the characteristics idea in describing the job. Both the factor comparison and the point systems use this concept of job characteristics, which are
commonly called "factors."

Undoubtedly, the early job analysis efforts of the psychologists influenced the adoption of the factor approach. The job analysts (psychologists) were concerned with psychological characteristics or demands of jobs, which could be related to the abilities and aptitudes of employees and potential employees, thus facilitating the placement of people in jobs for which they were best suited. Many of these psychological attributes are utilized in job evaluation. The approach, however, of psychological job analysis was directed toward the man, rather than the job. In considering the question of the economic worth of the job, translated into terms of the base rate (or rate range), the approach was directed toward the job. The question was, what are the measurable characteristics of the job, characteristics that are constant no matter which individual might fill the job, and that are related to the base rate to be paid to whomever fills the job. In other words, such elements of the work situation (although unquestionably important) as the attitude of the management toward suggestions, opportunity to train for promotion, vacation policy, retirement benefits, etc. are not included in a consideration of relative base rates. Those factors which generally have to do with the work itself, either from the standpoint of minimum performance requirements or conditions inherent in the job, have been developed to
provide standards of measurement. This is an extremely important and fundamental postulate — that job evaluation deals with job content, and disregards individual personalities, as such, involved in the jobs. This concept is also difficult to objectify, and only be careful and consistent development and administration of the program can it be accomplished. The integration of other elements into the job evaluation program is recognized, but basically job content is the primary concept.

**Individual Differences.** The question of individual differences is fundamental to industrial psychology, and implicit in job evaluation. Although one of the main assumptions of job evaluation is that the procedure is designed to measure "job" characteristics rather than "employee" characteristics, nevertheless it is inescapable that the range and types of human abilities, capacities and aptitudes in part determine the characteristics and values used in job evaluation. Viteles clearly develops the relationships between the psychologist's concept and determinations of individual differences and job evaluation scales in the following:

At first glance, there would seem good reason to use wide extremes because of the apparently wide difference between superiority and inferiority in any trait or skill. So, for example, the difference between the general intelligence required of the janitor and that demanded of a highly skilled worker or top supervisor appears to be well nigh limitless. Actually, in terms of numerical values,
the general intelligence of the successful employee in such a 'top job' is seldom found to be more than three times that of the most stupid worker in the least responsible job.

The ratio of 1 to 3 between the extremes of ability, and an even lower ratio of less than 1 to 2 for physical measurements, measures of motor function, production records, etc., recur with striking frequency in studies of individual differences in ability, skill and other human traits. Very seldom is the ratio greater than 5 to 1. Such facts further support the desirability of using for each factor employed in job evaluation a range of points in which the maximum is no more than 5 or 6. This relationship should hold whether the actual range in points for each trait is 10, 100, 500, 1500, or whatever it may be, although as indicated in the earlier discussion, the author favors a narrow in preference to a wide range of score points. The extended ranges of measures with ratios of 1 to 10 and 1 to 20 employed in many job evaluation programs are entirely out of line with the realistic facts of human nature. Consideration of this situation may contribute to both the improvement and standardization of job evaluation programs. (73, p. 170)

Many studies (see for example, Tiffin (47)) demonstrate that abilities measured in terms of production on specific jobs range approximately in a two to one ratio, and follow a distribution closely resembling normal, but usually skewed. Also, some sort of incentive plan is usually in operation to bring out this range. If artificial restrictions are placed on the production performance, the results (as expressed in production records) cannot be used to establish possible ranges of individual differences. It will be noted that most of the ranges, or ratios, of human abilities are related to specific traits, such as intelligence, dexterity, visual
acuity, or to performance on specific jobs. Job evaluation, on the other hand, attempts to measure the combined effect of the demands and conditions of jobs which must be met by the employee applying various abilities in different proportions, and being subjected to various characteristics and conditions inherent in jobs. Theoretically, the evaluation is based on a concept of the minimum performance which is required to adequately perform the job, and the person who just meets these minimum qualifications of performance is in a sense the determinant of the value placed on the job. As an example, if it is determined that a certain job has demands relating to educational attainments equivalent to that usually achieved by completing the eighth grade, then it is expected that a person who only finished the eighth grade has at the least the minimum (related) capabilities to perform the job. This job would be rated lower on the specific scale (e.g., Education) than would a job which had been classified as containing demands equivalent to high school education. It is recognized, of course, that considering all the people who stopped school at the eighth grade, a wide range of individual differences exist. The job evaluator must decide, in establishing his concept and rating value for the "eighth grade" category in his plan, just where in the range he is going to establish his dividing line. Is he going to use the mean of the range, all of the range, top
three quartiles, or just a vague idea that since the job requires some reading, writing, and little arithmetic, it ought to be classified as "eighth grade"? Actually, the total range of such a factor as Education usually is divided into five to seven degrees or levels, and the problem of discrimination is not as difficult as indicated above. (Reference here is to the point type plans, as mentioned in the quotation from Vitelés above.) Nevertheless, there seems to be a large area of unclarified concepts regarding the determination and definition of specific and objective requirements and demands of jobs at various levels of difficulty. Certainly the fundamental concept of individual differences, utilized so effectively in psychological tests for placement, training, etc., could be related to job demands and conditions, in a manner that would provide a more objective measure of relative job worth. For example, if "Training and Experience" is a factor, the scale is frequently divided into periods of so many months each (usually in some progression), and each division is assigned a weight. In this instance, an analysis could be made of training programs, individual employee's records, and other factors such as results of intelligence tests, in order to assist in properly classifying various levels and jobs. The very unpleasant problem immediately arises as to the reclassification of those jobs for which new and superior training methods
are devised, thereby reducing their training time. This situation is analogous to the problems raised in connection with technological changes, discussed in Chapter V.

William Gomberg (62) has another point of view in regard to individual differences, and he states that:

No job can be worth more than the maximum capacities a man is expected to bring to a job. On the other hand no job can be worth less than the very marginal capacities a minimum human being must of necessity bring to a job. If the president of a great corporation seriously believes that he wants the pay scale based upon the relative objective value of a job then he is obliged to take for himself no more than five times the hourly rate which he pays to the lowest employee in his establishment.

The trade unionist has discovered that the corporation executive will not be satisfied with such an arrangement. It is fruitless to expect complete rationalism in a wage policy when almost all other economic policies possess irrational elements. Pricing policies are not always based on cost. (62, p. 2)

In the above paragraphs, Gomberg is referring to Viteles' comment that, "Very seldom is the ratio (between extremes of ability) greater than 5 to 1." If the only determinant of job worth was "intelligence," (the example used by Viteles) Gomberg certainly has an excellent point. However, a fallacy is immediately apparent when it is realized that the president's job has several other determinants besides intelligence, as does the janitor's. It is the combined effect of all these determinants, (intelligence, initiative, experience, skills, responsibilities, etc.) each
with its respective ratio of abilities, that makes the true difference in job worth. This consideration, plus the factors of tradition, supply and demand, security of the job, career prospects (the president has already reached the top, except for the job of chairman), and so on, which are factors which Gomberg strongly advocates, enter into the determination and justification of ratios of 20:1 for president and janitor. It is generally considered impractical to evaluate by conventional job evaluation methods such top executive jobs as president, vice-presidents, department managers, etc.

Two aspects regarding individual differences have been presented: (1) the range of performance, including quantity produced, on individual jobs, and (2) the range and combined effect of abilities at various levels in the organization. The first of these aspects is frequently included under the heading of "merit rating." Job evaluation procedures are concerned from the standpoint of ranges in each labor or wage grade. One theory is that the base rates of all employees in any given labor grade should be normally distributed dollar-wise within the grade. However, there are many conditions that would make such a theory invalid. One such condition would be that in which most of the employees in a particular class or grade had approximately the same seniority, and were grouped near the top of the dollar spread.
The size of rate ranges has been determined very largely by empirical means and negotiation. There are many problems connected with the application of rate ranges, some of which are concerned with merit rating, some with payroll administration, some with wage survey results, but these are only indirectly the concern of job evaluation.

The second aspect referred to above regarding individual differences, does pertain to job evaluation, and most of what has been written about the theory and practice of job evaluation is in effect an oblique discussion of individual differences. It would seem that if job evaluation is to advance from the stage of empiricism, this subject would be the basis for coordinated programs of research and development.

**Job Satisfaction.** In discussing job evaluation as a job content concept, a limited approach is necessary, and other elements of the work situation should be mentioned, if for no other reason than to set them in proper relationship to the specific topic of job evaluation. Recently a number of studies relating to job satisfaction have been conducted. These studies generally demonstrate "that wages are not the most important factor in job satisfaction." (7, p. 93). Such factors as "congenial work conditions and social contacts, responsibility, initiative, prestige, in line with vocational aspirations, (and) variety" (7, p. 92) are reported to be reasons why people prefer one job over another.
or two of the items mentioned (responsibility and initiative) are often included as factors in job evaluation, the general premise being that responsibility (of various types) is an inherent part of the job and must be considered as one of the determinants of the value of the job. However, from another standpoint, items such as those mentioned above depend more on the social and psychological elements of the organization and the people in it, than on the (objective) job content. This is not to say that properly aligned wages, and wage levels, are not important factors in maintaining worker efficiency and morale. The number of labor disputes involving wages exceed the number from any other cause. (It is recognized that in many cases, wages are merely the outward, surface, tangible, factor of disputes, and the real difficulties may be underneath in another area of job satisfaction (or dissatisfaction)). Taking another perspective of this problem of wages and job satisfaction, it is possible that wages are not the most important factor in job satisfaction, because wages have been given more study and are not as badly out of adjustment as such elements as "social contacts" in industrial organization today. If for example, one person's, or one group's, wages, were suddenly placed "out-of-line" by, say 50%, the resultant dissatisfaction would be evidenced immediately in some direct action. If this were the rule, then consistently, drastically, "out-of-line" wages
would rank much higher on the scale of job dissatisfaction. Nevertheless, wages are the principal, quantified, universal, measure of a job's and a man's worth, plus the fact that wages received enable a person to maintain his economic existence within the "class" or "level" he has attained. In this connection, most people feel that a position (job) with a relatively high degree of responsibility or prestige, and that does not have comparable remuneration, is at best a hollow achievement. This does not apply, of course, to performance of honorary civic duties (chairman of a community chest division, etc.) for which there is no pay, but responsibility and prestige are high.

Thus the rationale of job evaluation is to establish ultimately a base (quantified in terms of wages) which will eliminate relative job worth as an element of job dissatisfaction. If the objective factors of basic job worth can be systematically analyzed, classified, and quantified by logical steps, not only is the administration of wages made more effective, but some of the attendant problems of prestige and social contacts etc., are more amenable to analysis and control.

II. FACTORS USED TO DETERMINE JOB WORTH

In regard to the abstract factors used to measure job value, several have been mentioned previously. Most plans
utilize the following general factors, with more specific factors under each:

- Skill
- Effort
- Responsibility
- Working Conditions

Otis and Leukart (35) list a large number of sub-factors and variations - eighty-eight for factory jobs and seventy-four for clerical jobs - which have been used in one plan or another. For purposes of illustration, the factors developed by the National Electrical Manufacturers Association (NEMA) (83, 79) will be used. These factors are representative, the NEMA plan has wide application in light industry, and much of the research (e.g., Lawshe, et al) in job evaluation has been carried out in connection with this plan. The other principal type of job evaluation system, Factor Comparison, utilizes only five factors: Mental Effort, Skill, Physical Effort, Responsibility, and Working conditions. Nevertheless, under each factor, the raters must consider a large number of items which characterize the particular general factor. The NEMA factors are as follows:¹

<table>
<thead>
<tr>
<th>Maximum Points</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Education)</td>
<td>70</td>
</tr>
<tr>
<td>(Skill)</td>
<td>110</td>
</tr>
<tr>
<td>(Initiative and ingenuity)</td>
<td>70</td>
</tr>
</tbody>
</table>

¹ See Appendix D, Table XIX, for complete listing and weighting of these factors.
The usual arrangement is to divide each factor into degrees, assigning a value (or range of values) to each degree. These factors and degrees are carefully defined, frequently illustrated with examples of jobs (key or benchmark jobs) so that by means of a comparison with the job description, the appropriate weight or degree value can be selected. The details of procedure of various plans are covered in such references as Lytle, Job Evaluation Methods, (20) Otis and Leukart (35), or in the manuals of specific organizations, such as NEMA, Job Rating Manual (83) and Guide for Use of Job Rating Manual (79). This procedure is similar to the psychograph method developed by Viteles (53, 52) for job analysis in which thirty-two (32) traits are defined and used in connection with a five-point scale on which the relative importance of that trait for a special job is indicated. The psychograph, however, was not intended to measure the relative value of the job, but to determine the degree to which certain traits or characteristics should be possessed by a person qualified to perform the job. The two
approaches (job evaluation by the point method and a job analysis psychograph) are similar in that an attempt is made to quantify characteristics related to jobs for more objective and accurate measurement and classification. Job analysis is treated in more detail in Chapter VII, The Scientific Method and Research in Job Evaluation.

Semantics. There are at least three fundamental and difficult problems in connection with the use of factors and degrees. The first deals with the semantics of the situation. It is not always possible to define factors and degrees in completely objective terms such as weight, time, dollars, etc. For example, a degree under the factor "Responsibility for the Safety of Others" might read: "Must exercise reasonable care in own work to insure safety of others. Possible accidents would be of a minor nature." It is evident that individual interpretations of this type of definition will vary with the individual over time, and between individuals. If ratings are to be consistent, great care in training raters is necessary, and frequent statistical checks for abnormal deviations or trends is necessary. Re-evaluation of jobs is also a check on consistent understanding and interpretation of definitions. Of most importance, however, is the careful wording of the definition, mainly to avoid ambiguous terms and to make each degree self-sufficient but limited.
Additivity. The second important problem is that of the nature of factors and degrees themselves. A job is a complex whole, but the premise of the quantitative type plans is that factors are additive, and generally, linear. These plans presume that the job content is made of, for example, 10% education, 17% experience, 8% initiative, etc., to a total of 100%. Or it means that an employee is paid that many cents (on base pay) for each of the factors. That this presumption has defects is obvious, but one answer to this type of analysis is that the factors only attempt to measure the job, and are not the job itself. They are external, abstract, although quantified, means of arriving at an estimate of the worth of a job in relation to the worth of other jobs, rather than the internal, concrete, job itself. The problem of additivity is discussed below and, in Chapter VII in more detail. It is mentioned here as one of the characteristics of job evaluation plans, preparatory to a more complete analysis of "factors."

A list of job duties and a job specification come closer to identifying the internal nature of the job. Thus, a comprehensive, accurate description of job duties, and a specification of job requirements is absolutely essential as the basis for evaluation. Duties and requirements are "matched up" against factor and degree descriptions, the degree most closely approximating the duties and requirements
being the one selected. At this point considerable judgment on the part of raters is required, and again training in consistent interpretation of data and descriptions is essential. Likewise statistical checks for biases should be made to correct or allow for such errors.

Criteria for Factors. From the above discussion it is evident that certain criteria should be established for selection and defining of factors, and degrees within factors. The following list is submitted as these criteria. Factors and degrees should be:

a. Homogeneous
b. Mutually exclusive
c. Cumulatively exhaustive
d. Practically meaningful
e. Readily quantifiable

For a factor to be homogeneous means that it pertains consistently to the same quality or aspect of jobs. For example, if the factor used above, "Responsibility for Safety of Others" is decided upon, it must, in all its degrees and interpretations deal first with responsibility, and only one type of responsibility, and in like manner, safety of others, and not in one degree definition, for example, include safety of self. The factor must consistently measure the same thing. Basic to proper understanding and interpretations of such factors is, of course, uniformity in defini-
tion and meaning of such words as "responsibility" and "safety."

The mutually exclusive criterion requires that all other factors be precluded from the definition of the particular factor in question. This is somewhat related to the homogeneous concept, but is more restrictive, particularly in defining degrees. This criterion is particularly difficult to apply because of the complex nature of jobs. For example, making a clear cut distinction between Physical Effort and Mental-Visual Effort, so that one will not overlap into the other, presents an almost impossible requirement. This, and other examples that can be readily observed, indicate that actually these measures (factors) are not additive but are related in a factorial manner, and are correlated to a rather high degree in some cases. This means that two or more factors are in reality measuring the same basic characteristic of jobs. The researches of Lawshe (63-69) and others discussed in Chapter VII bring this out by a factor analysis of several installations of the NEMA and similar plans. If the specific factors can be thought of as being represented by circles, these circles, rather than just touching other circles, overlap by various amounts. It can be seen where each circle (factor) may meet the criteria

\[1\] Reference here is to the statistical term as used in "factor analysis."
of homogeneity, but not of mutual exclusiveness. The amount of overlap is not discernable by any simple, subjective analysis of factor and degree definitions. It can be reduced in a general way by following certain principles or guides in addition to the criteria listed above. One of these guides pertains to the number of factors used. The number varies in different plans from four or five to as many as 30 or more. Viteles, in A Psychologist Looks at Job Evaluation (73), analyzes the situation in the following manner:

The general tendency seems to favor many rather than few factors, in direct violation of the 'law of parsimony' which should find a place in this as it does in other fields of analysis.

In practical terms, as Burk of the Atlantic Refining Company suggests, the use of a large number of factors complicates the application of a job evaluation plan by making it necessary to draw distinctions so fine that it becomes difficult for workers and operating executives to grasp the differences involved. The findings of the psychological laboratory support the judgment of the job analyst who insists upon reducing the number of factors to be appraised to a minimum consistent with the adequate differentiation of jobs. The author hazards the opinion that the total number should probably never be greater than 10 and can in most instances profitably be limited to 5. (73, p. 186)

In discussing number of factors, the criterion, cumulatively exhaustive, must be considered. This refers to the requirement of completely covering all aspects or measures of a job. Thus, two factors, Experience and Responsibility for Safety of Others, for example, might satisfy the other
criteria, but, at least in the minds of workers and management, would not be sufficiently inclusive to cover adequately the total measure of jobs. The results of Lawshe's studies (63-69) demonstrate, by the use of certain statistical methods, that three, two or even one factor, can adequately measure jobs' relative worth. There are certain drawbacks to the practical use of such procedures, but they indicate that a large number of factors are not necessary. The average number in actual use appears to be about ten or eleven, being strongly influenced by the widespread use of the NEMA plan with eleven factors.

In considering the two criteria, mutually exclusive and cumulatively exhaustive, it is apparent that some compromise is necessary for practical applications. That is, overlap of factors may have to be tolerated in order to secure coverage. Again the analogy of the circles will illustrate the point. If the total job is represented by a large circle, and the factors by the small circles, it can be visualized that a great number of small circles will probably cover more of the total area than three or four larger circles, even with these latter overlapping to some extent. If this analogy is representative of the actual situation, it may be concluded that these two criteria cannot be perfectly satisfied, but must be balanced against each other. Probably the approach indicated by Viteles and Burk above,
is an adequate guide in the design of job evaluation plans. However, this area requires deeper understanding which can only be gained by further research such as will be discussed in Chapter VII.

In order to satisfy the criteria of cumulatively exhaustive, all possible factors contributing to the worth of a job would have to be included. Again the practicality of fulfilling this requirement limits the number and scope of factors. Those factors which make the most important contribution are included.

The fourth criterion, practically meaningful, is more subjective in nature, and refers to the interpretative aspects of factors. The factors must be selected and described so that all parties involved will have a similar and consistent interpretation of what the factors mean and what it is they are supposed to "measure." Viteles (75) points out how factor and degree definitions can be made more meaningful in the following paragraph:

In some instances no effort is made to define or describe the factors employed as the basis for job evaluation. Few job analysts seem to realize that adequate definition of a term is not achieved merely by listing several synonyms, but only by describing in easily understood phrases concrete situations in which the factor operates. Of course, exceptions to this unfortunate tendency are to be found. Among these are the definitions employed in the job evaluation program of the National Electrical Manufacturers Association, which undertakes to indicate in terms of action pattern and of objective situations the exact meanings of various degrees of each factor. (73, pp. 167-8)
It is interesting to note that the NEMA plan, here praised by Viteles, is the subject of critical analysis by Lawshe (63-69) Gomberg (20, 62) and others, who conclude that the plan may yield entirely different results than anticipated by the designers of the plan, and that no more than three (selected) factors could do just as well as eleven. Gomberg's main objection is that the plan is not the result of negotiation, and does not consider previous understandings regarding wage relationships. Lawshe and Gomberg, however, do not criticize the selection or definitions of factors and degrees, but proceed to analyze the statistical aspects alone.

The criterion of readily quantifiable is necessary if any sort of scale is to be used in the job evaluation process. The ultimate result of the job evaluation process is a series of wage or labor grades to which dollar values are assigned. If the points, or other methods of quantification, are not readily transposable into these labor grades, the system may become unnecessarily complex. M. R. Lott's plan (see pages 112-117, above) was unduly complicated in this regard, whereas the Cooperative Wage Study plan (developed and adopted by the steel industry - see pages 298-306, below) merely adds the point values of the evaluated degrees in each factor to arrive at the actual labor grade, with no conversion.

Another problem in quantification is the progression of points from one degree to the next in the point rating.
plans. (The problem exists in the factor comparison system, but in a different way.) The definitions of degrees in their verbal connotation must be represented, as accurately as possible, by a series of numbers representing the degree values. If, for example, the series progresses 5, 10, 15, 20, 25 (as in several of the NEMA factors) the definitions must logically and interpretatively follow the same progression.

Usually adjective (or adverbs) denote the progression as, for example, in the instance of "Working Conditions," Factor 10, in the NEMA plan:

"1st Degree - Ideal. . . ."
"2nd degree - Good . . . ."
"3rd Degree - Somewhat disagreeable . . . not continuous. . . ."
"4th Degree - Continuous . . . several . . . particularly. . . ."
"5th Degree - Continuous . . . intensive . . . extremely. . . ."

The question is, do those words, referring to working conditions or (disagreeable) elements, actually represent such a progression, (5, 10, 15, 20, 25) or is some other progression more accurate in expressing quantitatively the intent and interpretation of the words? The selection of quantitative scale measures such as the above is usually an arbitrary procedure, or the arithmetic mean of several
independent (or not) judges, rather than one of the tested techniques of rating developed by psychologists. These techniques, such as "equal appearing intervals" will be discussed in Chapter VII, The Scientific Method and Research in Job Evaluation. It would seem that the designers of many point plans strive for a "logical" appearance, or straight-line relationships, or consistent relationships in the progression of degree values. This type of criteria has no basis or justification in the development of such important standards as job evaluation ratings. From this standpoint the factor comparison system, which utilizes (however, rather crudely), an established, accepted criterion of the rates of current "key" jobs, is more defensible, and realistic.

Comment on "Working Conditions." One of the assumptions presented on 156 above, was that "...each of the factors bears a significant association with the total measure of job worth. . ." This implies among other things that there is a logical relationship between the progression of values assigned to the levels or degrees, and the actual differences of the characteristics involved. For example, if the factor, "Responsibility for Materials" is part of the plan, it would logically be expected that the rating values (points) would increase with the cost of material which could
become involved in damage or loss, other things being equal. "Working Conditions," the example cited above, is a factor found in the great majority of job evaluation systems. In this case, the logical arrangement of degree or level values would be for the values to increase as the conditions defined in the degrees worsened, a positive correlation.

The last mentioned factor, "Working Conditions," presents some contradictions which indicate the complexities and subtleties of evaluating job worth. An example of a wage scale which has a negative correlation with working conditions is found in the case of Motion Picture Machine Operators. In one midwestern city, the weekly salary of Projectionists in the large downtown theatres, where conditions are "ideal" is more than $100.00, while in the small, third class, inadequately equipped, poorly heated and ventilated theatres in the undesirable neighborhoods, the weekly salary is between $60.00 and $70.00. The wage scale correlates positively with admission charges and size of theatres, indicating what is actually the case, that the individual rates are negotiated by the theatre owners and the union on a basis of ability-to-pay. This arrangement also provides an incentive plan, in the sense that the new operators start in the cheaper theatres at lower salaries, and as openings occur in the better paying theatres, the senior operators are eligible to take those jobs. Thus the older
men, in point of seniority, are sure of being assigned, not only to the higher paying jobs, but to the theatres with the best working conditions. (See also page 206 below.)

Another problem of a contradictory nature in connection with Working Conditions is presented in the actual rating process itself, and has to do with the personal attitudes and biases of the raters. The job evaluation committee, or committees, if any, supposedly is composed of a representative group. It is usually the case, however, that some, if not a majority, of the committee are of middle class, or above, origin, and tend to consider occupations subject to outdoor or "dirty" conditions as being poor working conditions. In such a situation, either the scale point values will reflect this attitude by raising the values at the high (disagreeable) end of the scale, or placing certain jobs in a higher grade. From the standpoint of the individual workers, it is likely that a considerable number of them actually prefer to work outdoors and in what might be termed "disagreeable" conditions. This is not an argument to reverse the scale weights, but to point out that different groups have varying opinions as to what constitutes disagreeable conditions, or degrees thereof. It also illustrates that much of the rating in job evaluation is subjective. By careful descriptions, both of factor degrees, or job classes, and of the jobs themselves, this type of bias can be minimized and judgments made reasonably consistent.
Reliability. Reliability, or internal consistency, is much more important and meaningful than validity. Further, it is practical in that there are ways by which it can be checked. This also has been discussed above in connection with job evaluation structures as a whole, but it seems reasonable that consideration should be given to the internal consistency of individual factors and degrees. The methods of determining reliability are well known and described in such excellent works as Burtt, *Principles of Employment Psychology* (10), in connection with tests and with rating. To check the reliability of individual factors one or more of several procedures could be used. Probably the best reliability test is to re-rate the job at intervals as in the case of the Lawshe experiment referred to above. Not only the results of the total evaluations, but of individual factors can be analyzed. Those factors which show wide variations between raters (low correlation coefficient) would then be suspected and steps taken to correct the cause of the variations. The same procedure can of course be followed between raters.

One other fundamental consideration relating particularly to degrees within factors is the distribution of ratings of most or all jobs. This has a direct bearing on the real effect or weight of a given factor in the total rating. If the ratings of a given factor are all at one particular degree, this factor has zero weight, or acts as a constant
for all jobs. As the distribution becomes spread more widely over all degrees of a specific factor, the more relative weight that factor will have in relation to other factors. Thus it can be seen that unless all factors have the same distribution of ratings, (i.e., the same relative standard deviation), the assigned factor and degree values will not yield results as originally intended. Again this defect is more prevalent, but not as evident, in the point rating schemes than in factor comparison, but is present in the latter. In factor comparison, because only four or five degrees are used, the probability of one being a constant is not as great. However, Benge, Burk and Hay (6), in illustrating rates as assigned to rankings of eleven key jobs for five factors arrive at the following ranges:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Rates</th>
<th>Range</th>
<th>Mean</th>
<th>Std.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mental Requirements:</td>
<td>9-70</td>
<td>61</td>
<td>28.0</td>
<td>17.1</td>
</tr>
<tr>
<td>2. Skill Requirements:</td>
<td>9-70</td>
<td>61</td>
<td>32.2</td>
<td>15.0</td>
</tr>
<tr>
<td>3. Physical Requirements:</td>
<td>13-25</td>
<td>12</td>
<td>17.4</td>
<td>3.9</td>
</tr>
<tr>
<td>4. Responsibility:</td>
<td>10-133</td>
<td>123</td>
<td>43.9</td>
<td>32.7</td>
</tr>
<tr>
<td>5. Working Conditions:</td>
<td>7-18</td>
<td>11</td>
<td>9.5</td>
<td>3.2</td>
</tr>
</tbody>
</table>

The rank-order correlation (25) between the eleven key

\[\text{1 Distributions of rates are not normal, and } N = 1 \text{ is small. The large sigma for Responsibility can be attributed to one rate of 133, which is nearly twice the value of the next highest rate - 70, under any of the factors. Certainly the inclusion of such a rate in the key job scale should be questioned.}\]
jobs, first, ranked by total rates, and second, by the total less factors 3 and 5, is 0.97. This illustrates the effect that narrow dispersion in a factor, or factors, will have. While this analysis is not complete, it demonstrates, in part, similar conditions as shown by Lawshe, Rogers and others, that two or three factors are as adequate for evaluation as five, ten or more. (See also pages 285-6)

III. RANKING AND CLASSIFICATION

No mention has been made of the principles and fundamentals of the Ranking and the Classification methods. Both serve useful purposes, and if properly applied, taking full advantage of proved psychological processes, can be reliable and economically practical. Both methods, but especially ranking, consider the job as a whole as opposed to analysis of "component" parts. Both might be classed as "qualitative" methods, but in either case values can be and are assigned to the results.

This basic conflict between considering "wholes" and "addition of parts," is that there is doubt that the sum of points for different factors gives as true relative positions of jobs as ranking, particularly "paired comparisons." This view is held by Viteles (73) for example. Where jobs of a complex nature, such as executive positions, are to be evaluated, this becomes an important consideration. The
devising of appropriate scales becomes an almost impossible task, and in many instances, other problems, such as "the man making the job," creates a situation not amenable to quantitative interpretation of job content. Ranking and or classification become the only suitable means of even a semi-objective approach in such instances.

The factor comparison method makes use of the ranking procedure wherein key jobs are ranked one factor at a time. This is a combination of the two elements of conflict referred to above, which probably tends to offset or balance the errors common to ranking such as halo effect, bias, the fact that ranking assumes equal differences between ranks, and others.

Classification is probably the most subjective of all the procedures, wherein written descriptions of jobs are matched with written descriptions of classifications. The ability of the job analyst to use the "correct" words, and the personal knowledge, biases and prejudices of the classifier in interpreting the description have much to do with the final result. Again, however, this method can be more comprehensive and once acceptable class descriptions are available, a wide variety and range of jobs can be evaluated. The equity of final results, by whatever criteria they are judged, depends more on the training, integrity and consistent judgment of analysts and classi-
fiers than on any inherent qualities of the system itself.

IV. JOB DESCRIPTIONS AND SPECIFICATIONS

No matter what particular system is to be used in evaluating jobs, adequate job descriptions and specifications are essential. The descriptions and specifications may be used for a number of purposes other than evaluation. In fact their value is such that many programs of personnel administration are dependent on job descriptions and specifications, even if a job evaluation program did not exist. It is important, nevertheless, to design and use the descriptions to fit the requirements of job evaluation, if such a program is in operation. The particular requirements of factor definitions must be constantly integrated into descriptive material. For example, if Responsibility for Safety of Others is a factor, the job description must describe in specific, concrete terms, using objective data if possible, the duties and conditions of the job which require any incumbent to assume such responsibility and to what degree.

Job analysis, as developed by industrial psychologists (see Viteles, Industrial Psychology (52), and Burtt, Principles of Employment Psychology, (10) for discussions of the psychologist's concern with job analysis) can prove to be a valuable guide in developing job descriptions and specifica-
tions for job evaluation. The ultimate use, as pointed out elsewhere, of this tool is to relate job characteristics to the psychological and physiological traits of employees to insure proper placement, training, counseling, etc., of employees.

Other sources of job information are time and motion studies, job instructions, Dictionary of Occupational Titles, published by the United States Employment Service, and the usual methods such as interviews, check lists, questionnaires, etc. The mechanics of collecting and tabulating job data are discussed in detail in such references as Otis and Leukart (53). The essential point is that the job descriptions and specifications must be as nearly complete and objective as possible so that raters, of varying backgrounds and biases, will get substantially the same impressions of jobs. This one item, plus careful training, experience and correction of biases by statistical analysis, of raters, will accomplish more in achieving reliable, equitable evaluations, than exact weighting of points or similar refinements.

V. CONCLUSIONS

In concluding this section on fundamentals and principles, it can be ascertained that job evaluations is made up of two inter-related but distinct concepts. The first is the job evaluation program - the system, with its factors,
points, descriptions, scales, degrees and other definite patterns. The proper development of this structure is highly important, just as the proper design and construction of a building or complex machine is highly important if it is to function as intended. Certain principles apply in the development of a job evaluation program, just as certain scientific and engineering principles must be correctly used in the design of a machine. The program must be designed to fit the particular environment, the types of jobs and organization it is to be concerned with. This has to do with not only size, but stage of personnel and management development, receptiveness of management and union (if any) to a particular plan, the problems of wage differentials and inequities that exist, time and budget limitations, or a number of other factors upon which hinge the decisions regarding installation. However, once the program is set and in operation, the relationship of the parts is fixed, until the program has proved to be inadequate or incorrectly designed.

The second main element of job evaluation is "judgment." Judgment varies from the type required in solving some of the problems of development and installation just referred to, to the judgment of raters in actual evaluation of jobs. The first type mentioned is managerial judgment, and is the most important, and has to do with the broader questions, and requires a deep understanding of the problems, principles and implications of job evaluation.
Judgment is needed in just how far to go (time and dollar-wise) in making detail statistical analysis of data developed; or, whether to adopt, with modifications of subjective, empirical nature, a plan such as the NEEMA plan and save considerable developmental time and expense. The acceptance or non-acceptance of hypotheses along these lines frequently cannot be based on quantitative statistical analysis, but on qualitative knowledge of the interactions involved in complex organizations.

The judgment of raters in actually evaluating jobs is more amenable to training and analysis. Their actions produce quantitative data that will reveal serious deviations from the average or some other datum. Their personal biases, their "mental set," can be controlled to an extent by proper explanation of the purposes and procedures of the program, and by experience with rating.

Research is needed in both the "system" and the "judgment" area. The two are inter-locked and cannot be studied separately. Questions regarding number of factors, type of factors and descriptions, number of degrees and their progression, ranking versus point rating, etc., should be studied in connection with the fundamental question of which combination facilitates the reliability of the judgment factor to the greatest degree.

Another fundamental question is the role of labor unions in connection with job evaluation. The union
position, generally speaking, is inconsistent, with one union favoring and another rejecting job evaluation. Of those not opposed to such programs, however, the attitude has been that, "Job evaluation is a guide to judgment in collective bargaining; it is not a sole criterion of what should be the relative wage scale." (2O, p. 12). Thus labor stands on the proposition that the results of job evaluation procedures are not the final answer, but the starting point in the collective bargaining process and that the role of job evaluation, as far as wages are concerned, is limited to that of a "tool" for "measuring relative job content exclusively." (2O, p. 12)

The final point in conclusion of this section is that, at the present stage of development, job evaluation is a poor measuring device, but can provide "...a procedure designated to establish an equitable basis for compensating employees, as a substitute for the hit-and-miss basis of compensation so widely applied in the past, as a basic need in promoting the adjustment of workers." (Viteles, 73, p. 11). This would indicate that the fundamental objectives of job evaluation are sound, but the methods need refinement and improvement.
CHAPTER IV

ECONOMIC ASPECTS OF JOB EVALUATION

Economic theories and forces play what might be termed an indirect part in determining internal job relationships, especially in those cases where a job evaluation program is in effect. This is because, under job evaluation, job relationships, theoretically, are based on job content and requirements, and not upon economic factors of supply and demand, position of company in relation to competitors and others in the community, cost of living, purchasing power, etc. Nevertheless, economic factors do have a bearing, especially on the over-all and long-term operation of job differentials, and the immediate, short-term problems can be viewed, partially at least, in light of these factors. The fact that the scales, grades, groupings, point values, or whatever measure is developed by the job evaluation procedure, form the basis for actual wage rates, inescapably imposes an economic quality upon such procedure.

The historical development traced in Chapter II, shows that job evaluation has had its principal growth and widespread acceptance during a period of steadily rising wage levels. It has been shown that frequently, especially during World War II, workers associated job evaluation and wage increases. "It can be said, therefore, that the circumstances of recent years have been exceptionally favorable to the
acceptance of job evaluation and have resulted in impressions and beliefs about the real substance and significance of job evaluation which reach beyond its intrinsic value and may eventually lead to disappointment." (65). Thus the general economic climate has had a bearing on job evaluation, as stated above, from the long-term, over-all viewpoint. How job evaluation procedures as now generally followed will fare under adverse, declining, economic conditions has not been put to a severe test, although a number of companies have maintained programs through recessionary periods.

I. WAGE CRITERIA

More specifically, there are certain phases of economic thought that pertain to wages, and for a summary of some of these, reference is made to Professor Sumner H. Slichter's Basic Criteria Used in Wage Negotiations, (42). He lists seven criteria as follows:

1. The minimum necessities of workers.
2. Changes in the cost of living.
3. The maintenance of take-home pay in the face of reductions in hour.
4. Changes in the productivity of labor.
5. The ability (or inability) of the employer to pay.
6. The alleged effect of higher or lower wages upon consumer purchasing power and employment.
7. The wages paid in other industries or places.

The first of these criteria is particularly important in administering minimum wage legislation, but it is also frequently used by unions in wage negotiations. The third criterion is used
only by unions. The remaining five (5) criteria are used by both employers and unions (42, pp. 8-9).

It is clear that only a relatively small proportion of factors under the above criteria could be associated with wage differentials. Some of the factors presented by Professor Slichter are discussed below.

Maintenance of Take-home Pay. In connection with the third criteria, an example is taken from the change in conditions following the Second World War, as follows:

ADJUSTING WAGES TO PRESERVE TAKE-HOME PAY WOULD HAVE PRODUCED A POST-WAR WAGE STRUCTURE WHICH HAD NO RATIONAL RELATIONSHIP TO POST-WAR CONDITIONS.

The pattern of wages after the war should reflect the post-war pattern of the demand for labor and of the supply of it in different occupations, industries, and places; that is, it should be designed to induce workers to move away from occupations, industries, and places where labor surpluses exist, into occupations, industries, and places where there are shortages. (42, p. 21)

The job evaluation connection with such a problem would be in the area of re-evaluating jobs which were distorted as to content by such unusual, emergency demands. Many jobs, because of production demands, were sub-divided into relatively simple operations during the War. If properly evaluated, the rate for the job as sub-divided would be less than the more complete and complex operation of normal times. This situation, and such problems as rates being forced out of line by various pressures, can be analyzed by a job
evaluation procedure to help construct a realistic wage structure.

**Ability-to-pay.** The question of ability (or inability) to pay may not affect the relative positions of jobs within companies' wage structures, but Slichter makes the following pertinent observation:

Although unions lean very strongly toward the principle of uniformity, in preference to the principle of ability-to-pay, they make some use of the principle of ability-to-pay. One method used is to classify employers into groups and to impose higher wage scales upon the groups that are better able to pay. Unions do not regard the principle of uniformity as being violated if the same wage scale is imposed upon all employers within a given class. Thus it is not considered a violation of the principle of uniformity to impose a higher wage scale for linotype operators in newspaper plants than in commercial shops. The building service employees in some cities classify buildings and impose different scales for elevator operators on the several classes. The highest scale applies to modern office buildings where the work is usually the easiest and most pleasant. Those buildings, however, are better able to pay and less able to tolerate a strike than less modern and favorably situated buildings. (42, p. 29)

The last two sentences of the above quotations are especially interesting from the evaluation standpoint in that the thought expressed is opposite to the general concept of working conditions used in many job evaluation plans. Thus a complicating factor is introduced, involving not only the specific job evaluation plan of a company, but the results of wage surveys used to set (or negotiate) actual rates. (See also pages 191-2 above) A related factor is that of
union versus non-union scales for the same work. When key jobs are evaluated to establish benchmarks for the alignment of other jobs—many of which may be peculiar to a given plant—these union and non-union comparisons may introduce insoluble situations unless careful distinctions are made. Frequently additional evidence, such as average annual earnings, is needed to arrive at logical conclusions.

Wages Paid Elsewhere. The most pertinent of the seven criteria, as far as job evaluation is concerned, is the last: "The wages paid in other industries or places." (This question invariably brings up the subject of wage surveys; and wage surveys will be discussed shortly from the technical aspects rather than the economic, the latter being the principal issue at this point.) Professor Slichter, in summarizing the "comparisons between plants or industries in the same locality," poses four questions:

The first question is, whether the wage rates or hourly earnings in the plants which are being compared accurately reflect the real price of labor in the several plants. Wage rates or hourly or weekly earnings, may be the same, but there may, nevertheless, be substantial differences in the price of labor. For example, if day workers in one plant earn precisely the same amount as piece workers in the same occupation in another plant, it probably means that the price of labor in the second plant is less than in the first, since piece workers ordinarily work faster than day workers.

The second question is, whether the jobs compared really require about the same skill and responsibility. The third question is, whether
differences in steadiness of employment, hazard, or other conditions of work justify a difference in the price of labor. The fourth question is whether differences in the demand for labor justify differences in the price of labor. Frequently a higher wage is required to attract men into an occupation or a plant than to hold them. Hence, expanding occupations or enterprises may need a higher wage scale for a given type of labor than stationary or contracting occupations. (42, p. 36)

Closely allied to the above questions is the argument that historical, or long-established relationships between wage rates in several localities, plants or occupations should be maintained. Slichter points out that such relationships are not to be taken lightly, because "the quality of labor tends to adjust itself to the wage structure," of different plants. These relationships also have important social and status properties, and it is not difficult for an "objective" job evaluation program to completely ignore such important elements. The dilemma arises here in regard to conflicts between the rated structure of wages and those traditional job rates found to differ from this structure. This obviously is a point of negotiation (if a union or employees' representatives are involved), since "tradition" does not lend itself to objective analysis in the same manner as job characteristics. The point would seem to be that such "long-established relationships" must be recognized, and if necessary, treated as exceptions, or gradually adjusted with time to conform to the concepts upon which the remainder of the jobs are aligned. There would be no problem apparently
if all jobs fall in the "long-established relationship" category, or if none were so classified, as far as job evaluation is concerned. In the first case the relationship could logically be the basis for the wage structure, provided it met certain simple criteria, such as being reasonable acceptable to all parties. However, the difficulties arise when a sizeable portion of jobs fall in the category, and for many industries, this is the case. Professor Slichter concludes that:

In a rapidly changing world, however, the argument that traditional wage relationships (or price relationships) should be preserved has very limited validity. It obviously has no validity when there have been changes in the conditions of work or in the relative demand for labor among the several occupations, plants, or places. For example, during a period of rapid expansion wages in an occupation or plant may be pushed far above wages for comparable work. After the demand for labor in the particular occupation or plant has ceased to grow faster than the average demand for labor, there is no reason for keeping the differential.

(42, p. 40)

II. WAGE THEORIES

Productivity and Differentials. In addition to the discussion of criteria, Professor Slichter propounds a labor productivity and wage theory related to differentials which has a bearing on the policies followed by employers and unions. The theory is that:

Labor is distributed among occupations, industries, and places so as to produce a
largest possible net product when a small increase in expenditures for labor in any one occupation, industry, or place yields the same increase in net product per dollar of expenditure as the same increase in expenditure in any other occupation, industry, or place. Such a distribution involves two kinds of wage differentials:

1. Differentials which equalize the attractiveness of jobs in different occupations, industries, and places.

THE STRUCTURE OF WAGES HAS AN IMPORTANT INFLUENCE ON PRODUCTIVE EFFICIENCY.

Unless wages for a given degree of skill and responsibility reflect the differences in the attractiveness of various occupations, industries, and places, employers would have no incentive to avoid drawing men into unattractive occupations or industries, or to avoid locating their plants at unattractive places. Frequently, differentials in wages are needed to compensate men for part of the cost and inconvenience of shifting from declining occupations, industries or places to occupations, industries, or places where their productivity would be greater. And unless men in different occupations and individuals within an occupation are compensated in proportion to their effect upon the size of the product, they lack an incentive to improve their productivity. (42, pp. 41-2)

It should be realized that the above theory presupposes perfect knowledge of the factors involved by parties affected in order that the theory may be approached in practice. Such knowledge is, of course, not feasible. Nevertheless, if the theory is valid, it indicates the need and functions of accurately defined job characteristics and levels of skills, responsibility, hazards, etc., in relation to important economic factors such as productivity. The role of job
evaluation in such a theory is evident; and it can also be reasoned that the more accurate and reliable (and widespread) is the knowledge regarding differentials and the factors upon which the differentials are based, the more nearly will a "perfect" distribution of labor, and optimum productivity, be approached.

Theory of Limits. In connection with economic theory, Research on Wages: Report of a Conference held on April 4-5, 1947 at the Yale Labor and Management Center (87), presents some opinions regarding wage differentials within individual companies. Two viewpoints are expressed, the first being:

... that there is at any time an upper limit to the wage level which a firm can pay, although it is difficult to define this precisely. There is also a lower limit, although this is even harder to define and cannot really be regarded as a supply curve. The lower is influenced strongly by the local labor market, while the maximum is influenced mainly by the competitive position of the firm in its particular industry.

With these limits, the wage level cannot be regarded as determinate on economic grounds. . . . (87, p. 19).

Then, according to the Report, ". . . there seem to be two separate problems: (1) What are the factors which determine the limits of wages? (2) Within these limits, what does the individual firm do, and why?" Part of the discussion pertaining to the first question is indicated in the quotation above, but the Report also presents another view as follows:
A question was raised about the meaning of these limits, on the ground that the opposite of what had just been stated would more nearly correct, i.e., the upper limit of the wage level is vaguer and harder to define than the lower. One cannot take the full cost or break-even point for the firm as setting a definite upper limit, although out-of-pocket costs might tend to be a limit. The limit will depend on the length of time taken into account and other factors. Even if one can define these limits, if they are quite far apart much remains to be explained. (87, p. 20)

Economic Logic of Job Evaluation. In regard to the second question (above), two approaches were made in the Report, the first primarily involving a "theory of adaptive human behavior," which will be touched on in another section. The second approach has direct bearing on economics and job evaluation, but, unfortunately, raises more questions than it answers. Nevertheless, these questions are of basic importance, and to do them justice the complete statement appears below:

In addition to the question of general wage changes, two other aspects of management's wage strategy have great practical and theoretical importance. The first of these is the determination of the occupational rate structure. It is fairly clear that the rates for particular occupations are not set, as a theorist might suppose, at just the level required to induce workers in lower occupations to train themselves for the occupation in question. However, then, are they determined? Is there any economic logic in the job evaluation systems currently in vogue? Does adoption of such a system remove or even reduce the necessity for judgment, compromise, and bargaining about occupational rates?

The other key problem has to do with the administration and effect of incentive wage
systems. This is a fascinating subject which has been left too much to the industrial engineers. It is not possible here even to mention the range of questions which await investigation; they will be obvious to anyone who has read the engineering literature on the subject in a critical spirit. One suggestion may be offered: a simple charting of individual earnings per pay-roll period on any incentive job, preferably over a year or more, would be highly interesting and would almost certainly suggest many questions for further investigation. Even more interesting would be a comparison of the patterns obtained for different jobs in different plants. (37, pp. 38-9)

The question raised regarding "economic logic" of job evaluation schemes certainly is pertinent to this thesis. If there is no such logic, job evaluation is open to serious question as a technique in the wage determination procedure. Already, in connection with the discussion of Professor Slichter's theory (see pages 209-10 above), an economic justification for job evaluation has been presented. Another economist, Sidney C. Sufrin of Syracuse University, in an article, "An Economist Looks at Job Evaluation" (72) points out that job evaluation has two major functions: "In essence, job evaluation performs two major functions. First, it seeks to ascertain the wage structure of the market, i.e., the wages, income, and conditions of employment for persons of specific skills. Second, it seeks to develop in the firm a job hierarchy or classification, a structure of wages and conditions of employment which, while it meets the needs of the firm, adequately reflects the condition of the market. Thus for any job evaluation system to be successful, it must
be based on (1) an accurate, realistic labor market analysis, and (2) a reasonable, accurate job requirement analysis for the firm." (72, p. 303) Actually, wage surveys (market analysis) might be considered separate from the evaluation process, and can be carried on without benefit of job evaluation. Conversely, however, the complete evaluation process, up to and including the assignments of wage rates, is meaningless without a market analysis at some stage of the procedure.

Professor Sufrin deals with the problem of the value of job evaluation as follows:

The first question often asked of consulting economists with respect to job evaluation systems is 'are they worthwhile'? The answer must be 'yes', provided the job evaluation program is reasonable and accurate'. The reason for this answer is that if a formal job evaluation system does not exist, management is literally forced to construct one as it goes along. Improvisation is not likely to be so good as a planned program. If a few unskilled workers are desired, obviously an employer simply ascertains the wage rate for unskilled labor in the market and pays that rate. But as soon as the question of grades of labor and of paying a more efficient or more useful man in some proportion to his usefulness or productivity arises, many judgments regarding usefulness and productivity and competitive rates of wages immediately must be made. The history of business sciences is the history of analyzing and classifying business judgments so that each decision is not made anew, but rather reliance is placed on successful experience. Rules of thumb are often necessary and frequently very good, but they are never so valuable as classified knowledge based on the failure and success of previous decisions. Job evaluation attempts to classify past experience into an orderly procedure. (72, p. 304)
The article by Sufrin points out that a given employer's rates may be different from the market prices for labor of a given class. These differences may be for various reasons (different productivity, high wage policy to avoid higher tax brackets, to reduce turnover, etc.), but such reasons should be realistically analyzed, understood and related to other conditions and policies of the company. Professor Sufrin implies that in any one locality, the rates for a given class of labor will vary considerably, and although a single rate is usually determined (such as "average prevailing rate in the community"), this can be misleading unless the distribution of rates and reasons therefore are also determined. A real advantage, and one of the prime justifications for job evaluation, is that with accurate job analyses, descriptions and specifications, the market can be tested much more adequately. However, Sufrin does stress the importance of not over-simplifying market analysis. He indicates that such practices as "arbitrarily fitting a straight-line trend to wage data," have no basis in logic. Other fallacies along this line are (1) using insufficient data, (2) making unwarranted interpolations and extrapolations, and (3) not using appropriate statistical techniques.

The economist is also interested in the internal wage structure, and the distribution of employees within the various labor grades or brackets. Sufrin, for example, is con-
cerned with the "fallacy of symmetry" and he states: "There is no logical basis for assuming that the number of employees within a wage class follows any type of distribution. For example, a classification of common labor might very well have a great bunching of employees near the top of the common labor class. This would be especially true if the demand for common labor in the market were relatively strong. Failure to recognize this might lead to abnormally high rates of turnover among workers of this class." (72, p. 305) From the above considerations, it is evident that economic forces have an important bearing on the theory and practice of job evaluation.

Wage Surveys. Reference has been made to the wage survey or market analysis in connection with the economic implications of job evaluation. Certainly the wage survey is the connecting link between the internal evaluation procedure and the "facts of life" as they exist in the "market place." It is also certain that to do justice to the whole question of wage surveys, market analysis and related topics would require a document at least the scope of the present one. Nevertheless, to complete the analysis of job evaluation fundamentals, some of the more important aspects of wage surveys will be presented. It would appear appropriate that such discussion be included in this Chapter on economics.

A wage survey can be said to be a form of applied
research, in which the community rates, properly identified and quantified, constitute an exterior criterion which can serve as a basis for establishing absolute values for jobs within the organization. In present-day operation of business and industry, the wage survey, in one form or another, has become a widely adopted function. The knowledge of wages and salaries paid by other companies is an essential tool for unions, government agencies, institutions and business management. The larger and more complex the organization, the more formal and detailed becomes the market analysis. Many employers rely upon the survey as the principal determinant of wage rates to be established within their own organization. This is especially true of smaller companies which do not have formal job evaluation plans, and are not "organized" by a union.

There are numerous references dealing with the procedure for conducting surveys and it is not the purpose here to relate detail procedures. However, the principles of job evaluation require that an exterior criterion be established, and since the market or wage survey is the predominant means of accomplishing this, a critical look at wage surveys in general is in order. Mr. Belcher of the

1 For example: Belcher, D. W. and Heneman, H. G., How to Make a Wage Survey. Minneapolis: University of Minnesota. (Industrial Relations Center, Technical Report No. 2, 1948), from which the article "The Place of Wage Survey" (59) was taken.
Center for Continuation Study at the University of Minnesota, writing in Personnel (59), enumerates the reasons for the importance of wage survey data:

First, any organization employing people needs comparable wage data to maintain a stable working force. Unless employees regard their compensation as fair and comparable to what they could get in other similar organizations, their morale and output may be under power. And if they regard the wage problem as inadequate, they may seek employment elsewhere.

Second, business organization is not fulfilling its obligation to stockholders, nor is a government agency discharging its duties to taxpayers, if because of inadequate information more than the market rate is paid for workers.

Third, labor organizations using inaccurate wage data are not performing their function in the best interest of the members.

Fourth, the public is in need of sound wage information to guide public policy.

More specifically, it would be inadvisable for an organization - whether a labor union, business firm, or government agency - to enter into wage negotiation without adequate information. And certainly no new enterprise should begin selecting employees and no going organization should budget operations or install a job evaluation plan without a knowledge of wages currently being paid in the community or industry. (59, pp. 192-3)

Certainly the above listed reasons are valid and pertinent, but at the same time represent pragmatic criteria. And referring to Professor Sufrin's statement that "Job evaluation attempts to classify past experience into an orderly procedure," it is realized that the subject is treated much more as a business procedure than as a scientific method.
However, many of the elements of wage surveys and job evaluation are amenable to scientific research analysis. In certain instances, such as the Bureau of Labor Statistics surveys and reports, rigorous research methods (including statistical techniques) are utilized. The degree of compliance with such methods varies greatly, but it is not to say that non-compliance completely invalidates any information one employer may obtain from others, by even the most informal of means.

Two principle types of surveys are made, one being the intensive survey made by an individual firm, union or agency, for the immediate purpose of assisting in establishing specific wage rates. The other type is the extensive survey conducted by an association, government agency or other such body to provide general information regarding wages in a particular area or industry. The Bureau of Labor Statistics publishes results of its surveys in The Monthly Labor Review, Bulletins, Statistical Abstracts and special reports, and give the most comprehensive and uniform picture of wage structure throughout the entire country. In Chapter VII, The Scientific Method and Research in Job Evaluation, the question of problem definition, formulation of hypotheses, testing of hypotheses and drawing conclusions will be discussed, and will apply to both wage surveys and job evaluation.

To be most effective, intensive wage surveys should be
coordinated with a job evaluation program. Several reasons for this indicate the interdependence of these two procedures. In the first place, if wages are to be compared accurately, adequate and uniform job descriptions or specification must be used as a basis for gathering data. It is possible, of course, to develop adequate description without the ultimate goal of job evaluation, but such descriptions are ideally suited for both purposes, and therefore it would appear as a matter of economy (among other reasons) to secure the full benefit from them. Further, a carefully administered job evaluation program will require that job descriptions be kept current, another factor that wage surveys should be cognizant of, if wage data are to be truly comparable.

To illustrate further the relationship between job evaluation and wage surveys, a paragraph from the Yale Conference Report, Research on Wages, is quoted below:

It will frequently be found that the usefulness of existing surveys is limited by lack of continuity, changes in coverage and definitions from one period to the next, lack of sufficient care in the preparation of occupational descriptions, and defects of reporting; in such cases it will be necessary to make a fresh survey of the firms and occupations which one wishes to cover, obtaining wage data for perhaps one payroll period in each year over as long a period as company records permit. The main technical difficulties have to do with the selection of key occupations, the preparation of uniform job descriptions, and the treatment of variation in actual job content from company to company, and within the same company over the course of time. (87, p. 35)
It will be noted that the limitations and difficulties referred to in the above quotation are the specific items which an adequate and carefully administered job evaluation program attempts to control.

Two distinct areas of wages must be covered by a wage survey. These are the base rates (hourly, or weekly, semi-monthly or monthly for salaries) for each occupation or job, and in addition, the incentive earnings, and all the so-called "fringe benefits" which actually make up the total labor cost. These two must be rigorously distinguished, and treated in a uniform manner (that is, within each area). Otherwise, the survey data will not be measuring similar, homogeneous items, and will present distorted and erroneous results. Job evaluation, by consistently restricting its procedures to an evaluation of jobs and job content, serves to clarify that portion of the total labor cost associated with the base rates. This uniform understanding regarding both surveys and evaluations also will limit the area of controversy in wage negotiations. Base rates, and the additional earnings and benefits, can be negotiated separately, but with a consciousness of their interrelation, by specifically identifying each area at each step in the wage determination procedure. Further, from the standpoint of cost analysis and control, this clear distinction will facilitate administration.

The timing of the intensive wage survey will depend
upon such factors as funds and facilities for conducting the survey, frequency of wage negotiations, progress of installation of job evaluation program, or stage of administration of such program, practice of other firms or organizations in the community, etc. Also the type of job evaluation system may affect the timing. For example, in the factor comparison system, key job rates are the basis of evaluation. A survey is frequently made of these key jobs prior to actual evaluation, so that the rates used actually reflect the community average, or whatever criterion the company has decided upon. This procedure, however, can be undertaken only after job analyses and descriptions have been completed for the key jobs. These key jobs are usually the same jobs that would be included in the normal wage survey, again avoiding duplication.

In the "point" systems, the wage survey is usually conducted after a large portion of the jobs have been completely evaluated and relative point values assigned. The survey jobs then are assigned point values on the same basis as the company jobs, and comparative wage curves (points versus dollars) are plotted. This method presents a broad picture of the relationship of community and company rates which can be used for negotiation, adjustment of rates, or other purposes.

From the economic standpoint, other factors affecting wages and wage policy can also be determined from a survey.
The Yale Report, *Research on Wages*, enumerates the additional information that should prove valuable over an extended period of time:

If an independent wage survey is made, a number of other interesting data can conveniently be obtained from each company at the same time. These include: the date, amount, and method of application of all general wage changes made by the company during the period; number of plant employees; and turnover rates, including a breakdown of voluntary and involuntary separations. One can then analyze both the movement of inter-firm wage differentials and such related matters as the patterns of wage leadership in the area, the relation between rates of change of employment and wage rates, and the relation between the wage level of a plant and its voluntary separation rate. (87, p. 35)

In this section an attempt has been made to analyze the economic aspects of job evaluation. The principal relationship, and one in which economic factors can actually be considered, is between the evaluation process and wage surveys. The specific elements of evaluation, particularly job descriptions and specifications, key job selection, range of jobs with relation to difficulty and responsibility, and in certain cases, point values, have a deciding part in obtaining reliable and meaningful surveys. Lastly, there must be adequate statistical data and analysis in order to design, and interpret properly the results of, wage surveys and relate them to the data of the job evaluation procedure.
CHAPTER V

TECHNOLOGICAL CHANGE

Almost any phase of industrial society can be discussed in reference to technology or technological change. As a matter of fact, present industrial society might be said to be a result of technology, or that industrial development is an expression of technological change. All aspects of business and industry are affected by or correlated with technological changes, and job evaluation is no exception. Much has been written regarding the social and economic impact of technological changes; however, the present concern is with the limited scope of the technological problems that directly influence, or are influenced by, job evaluation.

Definition of Technological Change. To put this relationship in its proper setting, it is necessary first to define, or list, what is meant by technological change. Cooke and Murray, in Organized Labor and Production (14) point out that technological development "is not only dynamic but it is also compounded." By this is meant that one improvement or new device begets other improvements and devices, and extends into areas and processes perhaps not anticipating changes. Cooke and Murray then list the following as steps (methods) in modern technological changes:

Mechanical steps
1. Improved tools, hand or machine, including
specialized single purpose machines.
2. New or improved chemical processes.
3. Automatic attachments for new or old machines.
4. Improved machine assembly.
5. Increased speed of machines.
7. Better adaptation of machine units to their several processes.
8. Better materials for the construction of machines, improving their performance and prolonging their life.
9. Better and more easily workable materials for the manufacturer of products of better quality and greater durability.

Non-mechanical Steps

1. More effective utilization of mechanical power.
2. Economy of time and energy of operatives.
3. More effective flow of work within plant and between plants.
4. Incentive to greater efficiency on the part of workers and management.

But technology and its application to industry do not operate in a vacuum. Though exerting a tremendous influence on individual and social behavior, including industry and trade, technology is nevertheless the product of human endeavor devised and used primarily as a means to an end. In a capitalist economy based upon the profit motive, the functioning of technology is determined primarily not by its capacity to produce more goods and services to satisfy more human wants, but rather by its effectiveness in producing profits. (14, pp. 160-1)

Role of Job Evaluation. An examination of the above items will reveal that nearly all involve the possibility of changes in job content, if not complete elimination of specific jobs. Since job evaluation is directly concerned with job content, it is evident that job evaluation is in the
picture as one of the elements of technological changes. Nor can job evaluation, as a technique, be completely separated from the human problems of technological development. Bomberg (20) clarifies the interrelationships of these three factors, job evaluation, technology and the human element, in the following:

An important objection, difficult to dispel, is the worker's identification of job evaluation with the introduction of labor-saving devices, job dilution and the end of historical wage differentials. The journeyman machinist may see in it a threat not only to his wage rate, but to his prestige and status. The open-hearth gang in a steel mill may see in it the end of the promotional sequence to which their whole lives have become adjusted. Reduce the rate of the furnace foreman, and you shatter the aspirations of a dozen men below him who counted on holding that job some day.

It is inaccurate, of course, to say that job evaluation as such is to blame for these situations. If there is any cause-and-effect relationship it is the other way around. After jobs have been reengineered in such a way that work formerly performed by a single all-round craftsman is now performed by a number of specialists operating single purpose machines, job evaluation may or may not be used as a method of determining the value of the new jobs. If it is, and they are re-evaluated downward, it must still be acknowledged that such re-evaluation came as a result of, not before, re-engineering of the jobs. Job evaluation is merely a by-product of the continuing technological revolution. It is the measure rather than the cause of the change. (20, p. 13)

If considered in the light that it is not the cause but the result, or a contingent phenomena of technological changes, the limited position of job evaluation in this over-all problem can be realized. The policies and procedures regarding
the effects of technological advances are them outside the purview of job evaluation, per se. Nevertheless, job evaluation is often a contemporary procedure to engineering and methods improvements, and therefore has to be analyzed for its contribution to the general situation.

Union-Company Agreements. It is common practice today to include in the union-company agreement reference to both the job evaluation program (if such exists) and technological changes. An example of one of the more comprehensive clauses is found in the 1952-1954 contract between the Electro Metalurgical Company (a Division of Union Carbide and Carbon Corporation) and Congress of Industrial Organizations, Local Union No. 1796, Article V, Section 8 (b) and (c):

Section 8. (b) It is recognized that mechanical improvements brought about by the Company in the interests of improved methods and products, the development of new manufacturing processes and the use of new materials as well as changes in the character of jobs, may from time to time require the establishment of new job classifications or the re-evaluation of existing jobs. Under such circumstances the Company shall evaluate the new or changed job. The company shall notify the Union in writing of the existence of the new or changed job, and shall inform the Union of the classification and rate established for such job.

Section 8. (c) The Job Evaluation Review Committee may review the classification by the Company of the new or changed job within thirty (30) days after notification to insure that the job is properly placed within the plan. (77,p.11)

Other examples follow similar ideas. For instance, Oomberg (20) cites a clause from a United Rubber Workers of
America, C.I.O., contract as follows:

'In the event new equipment is installed for any operation, rates for jobs on same will be decided by a mutually satisfactory job analysis and evaluation. (United Rubber Workers of America, CIO)' (20, p. 57)

Change in Job Content: The usual implication is that technological changes result in the lowering of job classifications, thus permitting a more extensive utilization of workers at lower rates of pay. This undoubtedly is true in many cases, particularly in a growing, expanding organization or industry. For example, a relatively complex job in a smaller organization may be divided into several simple jobs as production volume increases. The new jobs are classified at a lower scale value than the original job. The problem is, of course, what to do with the employee who was on the complex job at the higher rate. There are a number of possible solutions, none of which are the direct concern of job evaluation. If, however, a policy of transfer of displaced employees to a comparable position is followed by the company, the job descriptions, specifications and rating of other jobs will be of material assistance in implementing this policy in specific cases.

Another policy commonly followed by various companies, is not to introduce technological changes until it can be done without discharging or reducing the pay of any employee. Cooke and Murray (14) illustrate this by an example from the
telephone industry in which dial systems were introduced "only to the extent that their switchboard girls naturally retire from service." Although many companies could not follow such a liberal policy, others can at least predict more reliably the effect of changes by pre-installation evaluation of jobs, time estimates and careful planning based on more accurate facts. For example, the writer is familiar with a new process installation of a large food processing company in which a complete job evaluation program was accomplished prior to the start of operations. The rates and duties were tentative, of course, but the evaluation gave management a clear picture of personnel, skills, budget and process requirements, greatly facilitating transfer and absorption of personnel displaced by the new process.

Although "job dilution" is a serious problem, and one that industrial engineers and others in methods work should be fully cognizant of, another type of situation also arises in connection with technological advancement. This latter is the creation of jobs requiring more skill, and different types of skills and demands upon employees. Such phenomena are becoming increasingly evident as industry moves toward more automatic controls for machines, and equipment of increasing complexity and capital investment. These developments have led, since 1910, to a decrease in the percentage of "laborers" (excluding mines and farms), an increase in "semi-skilled"
workers, a holding firm of the percentage of "skilled" workers, in the total work force of the country,¹ and the recent recognition of a new group known as "technical workers," or "technicians." This latter classification is of particular interest because it presents difficulties in evaluation not immediately apparent, and is related to the question raised above regarding different types of skills:

Technicians. The National Manpower Council (82) identifies the technical worker as follows:

The technical worker possesses a combination of skills and knowledge which are partly shared by professional skilled workers. He has enough theoretical knowledge and manual skill to perform routine and manual tasks for the professional or the theoretical planning tasks for the skilled worker. . . (82, p. 1.)

The technician, thus, possesses a combination of skills and knowledge that makes his job closely related to both professional and skilled jobs. Yet, he remains different from professional and skilled workers. If a technician's job were rated on the basis of (1) specialized knowledge, (2) frequency of use of personal judgment in a variety of situations, (3) knowledge of the workings of an entire industry, (4) training and experience required, (5) responsibility, (6) and manual dexterity -- these are factors common to job analyses -- the job would probably rank somewhere between the average store on each of the factors for the professional and skilled worker.

The technician generally has less manual skill than

¹ The National Manpower Council (81) reports:

<table>
<thead>
<tr>
<th>Category</th>
<th>1910 Percentage</th>
<th>1950 Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laborers</td>
<td>15%</td>
<td>6%</td>
</tr>
<tr>
<td>Semi-skilled</td>
<td>15%</td>
<td>27%</td>
</tr>
<tr>
<td>Skilled</td>
<td>11-14%</td>
<td>11-14%          (no change)</td>
</tr>
</tbody>
</table>
a skilled worker but more than a professional. He has less generalized knowledge than a professional but more than a skilled worker. He can become the 'hands' of the professional or the 'planner' for the skilled worker. Some technical jobs, therefore, emphasize analysis and diagnosis; others, familiarity with and use of manual skills. Some stress knowledge of industry, or applied psychology and supervisory ability, and others emphasize knowledge of tests and equipment. (82, pp. 5-6)

Probably the best example of a specific group classified as technicians are draftsmen. Other specific groups are electronic technicians, physical science aides, lawyers' private secretaries, physical therapists, x-ray technicians, etc., falling within the definition given above. With advances made in science and technology, the dividing line between a profession, a technical occupation and a trade is often hazy, but where a job evaluation program is extant, a basis exists (theoretically) for making distinctions on a grade or wage scale. If, as is often the case, a company uses two or more job evaluation scales, sets of factors and definitions, the problem would arise as to which category to assign different technicians' jobs.

Other types of jobs, new to industry, at least on a large scale, are the so-called "monitoring" jobs. The increased use of automatic, electronic controls in many industries (the ultimate end of this being the completely automatic factory) has given rise to the job of "operator" of large, expensive and complex equipment. Evaluated by certain standards, this job is relatively unimportant, but by others,
the job must be rated high. It is not the purpose here to perform a job analysis of this class of work, but it is evident that an entirely different set of skills, responsibilities and conditions exist in connection with monitoring type jobs than with short cycle machine operating jobs.

Much research work is being done by experimental psychologists in the type of operations just mentioned. For example, Chapanis, Garner and Morgan in *Applied Experimental Psychology* (11) report a number of research projects on design and reading of dials, gages and similar instruments. The use of control handles, switches, and knobs, presents problems relating to the skills, perceptions and capacities of human beings to cope with complex panels of such instruments and controls. How these situations are to be evaluated in terms of relative job content and job worth may require some new, or at least revised, concepts in job evaluation. The psychologists are already developing valuable information and theories, one being that humans are actually very poor monitors, and that instruments and controls are excellent for such jobs, and should monitor the humans. The new frontier, "information theory," holds much promise in revealing the correct balance of duties between man and machine. How these theories -- and the advances of science and technology as related to the people who operate, service and maintain the equipment, and what their jobs are worth -- are to be imple-
merited and coordinated, presents a challenge to any one attempting a rational, logical solution to the problem of equitable wage rates.

"Automation," a word coined to describe the phenomena associated with the automatic factory, has presented situations such as those referred to above. The evaluation problems become more subtle, and less amenable to objective determinations than in the case of manually controlled operations. If any "factor" approach is to be contemplated (such as the point systems or factor comparison systems), definitions and weighting of factors will require more study and research than is the usual case. Certain job characteristics, common to machine operations, for example, may completely disappear, or be combined with other characteristics. For example, S. I. H. Burk, one of the originators of the factor comparison system, is of the opinion that Skill Requirements and Mental Requirements (as defined by Benge, Burk and Hay (6), may have to be combined into an over-all Difficulty factor. In this case, Skill refers to a "muscular coordination" and "interpretation of sensory impressions" concept, whereas Mental refers to requirements for "mental traits," "education," "specialized knowledge," and related concepts. (35) These ideas and characteristic definitions will have to be examined from a fundamental, scientific, viewpoint to constitute a valid basis for judging job worth. Details of how research
is carried out on such problems is discussed in the chapter on the Scientific Method and Research.

**Skilled Workers.** Mention was made above of technical workers, or technicians, who compose a relatively new group in the advancing technology of today. A much older group, dating to antiquity in fact, is that of skilled workers, artisans, craftsmen. These latter also have been affected by the technological changes. New occupations and skills are created while others are vanishing, and this seems to be an accelerating process. A most significant phenomenon regarding the relationship of skills to society is set forth in the *Introduction to the Study of Skilled Workers* by the National Manpower Council (81) as follows:

*It was pointed out earlier that skills can only be considered relative to the general cultural abilities of a given society. At one time, reading and writing were abilities controlled by the few, and those who possessed them were highly skilled. Literacy is still a "skill" in many other societies and in some groups in the United States, even though it is taken for granted as a general ability. Similarly, present-day workers are the cultural products of an advanced technology. A British productivity team remarks that "machine-mindedness" appears to be inherent in the young people of the United States. A relatively untrained American would be regarded as highly skilled in certain other societies. Also taken for granted today is the discipline necessary for production in a modern integrated production system. It is not thought of as a distinctive cultural skill, even though it involves, not only punctuality and dependability in reporting for work, but habits of remaining at work and cooperating with others in production.* (81, pp. 9-10)
It is important to note that technological changes and development implies not only skills in crafts and manual arts, but also certain social or cultural skills such as "cooperating with others in production." The fundamental import of the social environment, and the skills required to perform adequately therein, is becoming of paramount interest to many thinking people in industrial society. The question arises then, what part does or should job evaluation play in this phase of industrial and business occupations? Some job evaluation plans, for example, include factors such as "Responsibility for Safety of Others," "Responsibility for Work of Others," "Capacity for Getting Along with Others," "Responsibility for Good Will and Public Relations," etc. From another standpoint, "cooperating with others" can be considered as a basic element of all jobs, such as "honesty," "normal health," etc. (whatever those terms mean). At any rate, "honesty" per se is not included in job evaluation plans, although a factor such as "Responsibility for Funds," may be. It would appear that serious consideration should be given to these social elements of jobs and the social skills required for adequate performance, in the establishment of job evaluation programs. Much thought and research has gone into the psychological factors of work, and sociology is beginning to make definite contributions to industrial and business life. Such advances as these may uncover and/or explain more
clearly the true bases of job content and relative job worth.

Labor's Attitude and Labor Disputes. Brief mention was made above the concern of labor in connection with technological changes. Some labor spokesmen take a strong (if irrational) stand regarding this problem, and present the relationships, imagined or real, as perceived by certain of the people directly affected. Solomon Barkin, whose article, "Wage Determinations Trick of Technique," is reprinted by Gomberg (20), has this to say regarding job evaluation and technological changes:

An illustration of employer bias in present systems of job evaluation is found in the fact that few plans acknowledged the propriety of paying a higher rate of pay for more productive equipment even if the job requirements do not change. Technological improvements are not a determinant of wages. These plans contend that increased productivity should be reviewed in setting the general wage level rather than in establishing individual rates. This attitude runs counter to management's statements that the benefit of new improvements should be shared with the workers. Both statements have been heard from the same platforms. Yet job evaluation representatives have resisted this basic principle, which organized labor considers an essential part of any program of adjustment to technological change. Management's prejudices are reflected in current theories of job evaluation. (20, p. 66)

To further illustrate the attitude of certain union spokesmen, Barkin (in Gomberg - 20) presents the theory of "payment according to highest skill employed," in the following paragraph:
Those plants which tried to re-evaluate jobs with each change in job content tend to create constant strife and difficulties. Unions have always challenged these attempts if they have assumed any volume. This practice of plants runs counter to the usual union policy of insisting that persons be paid according to the principal or highest skill employed. The particular pattern of job duties is considered secondary. Since these re-evaluations stem from changes in job patterns, they are looked upon most unfavorably by labor. This type of revision is certain to lead to the collapse of job evaluation programs. (20, pp. 69-70)

The practices of job evaluation do base pay on the job and not on the individual who occupies the job, and it is here that certain unions have objected to job evaluation. It is to be noted, however, that more and more unions are tacitly at least, approving of job evaluation plans.

Settlement of labor-management disputes by arbitration is an accepted procedure in the majority of companies which are 'organized,' and agreements carry provisions for handling such disputes. Wage disputes constitute a type of dispute that is continually recurring. An examination of a sample of arbitration cases will reveal that many of these wage disputes arise over determination of changed job content and a re-evaluation of such jobs, new jobs, reallocation of work, and similar circumstances which may develop out of a technological change.

In such disputes as mentioned above, the case can be settled by the arbitrator on the basis of evidence (facts) concerning job content as described by the parties, and the applicable portions of the job evaluation manual which defines
factors, degrees, key jobs' factor descriptions, or similar basic information. The evaluation manual, previously agreed upon by both the union and management, then narrows the area of disagreement, and forms a basis for interpretation of job "facts" as presented. It should be pointed out that the arbitrator may personally disagree with the job evaluation system and the specific method, point values, or other features of the plan, but if it is reasonably complete and accurate in describing factors, degrees, etc., then a uniform, mutually acceptable basis of decision is available. Nevertheless, the job evaluation program and procedure is a guide, and not a scientific measuring instrument, and judgment remains an important element in any decision required.

Not infrequently a consulting firm will be engaged by the company (or union, or both) to establish a job evaluation program, or to study the rate structure of a department or plant and make recommendations. The installation of new equipment or a new process, or other major technological change is often the stimulus for such a move. If the recommendations of the consulting firm do not meet the approval of both management and the union, and arbitrator may be called in to settle the issue. One such case is reported by Maxwell Copelof (15) where the arbitrator was to make the final decision on those rates submitted by the consultant which the company and union failed to agree upon. The con-
The arbitrator then viewed the final report of the engineers and made his own findings and award. He noted that a certain pattern or trend line seemed to appear in the rates for four jobs in other departments that had been jointly agreed upon by the company and the union as jobs that should be used for a comparative basis. He further noted that the engineers had closely followed this trend line in fixing new rates for the jobs in the double glazing department. Then the arbitrator made the following comment:

The arbitrator has also taken into account the fact, as pointed out by the engineers, that 'job evaluation techniques are merely aids to judgment and that judgments vary,' and that 'job-evaluation cannot be expected to be 'mathematically precise.' This is further supported by the company's admission and by the union's recognition of the fact that many of the existing rates are not 'mathematically correct' on the basis of 'true job values' or jobs upon which point ratings have been set.

The arbitrator determined it would be inadvisable to follow meticulously the rigid trend line by assigning individual rates to each of the jobs under dispute, and he therefore considered the various jobs in several reasonably related groups, which in his judgment will result in a more equitable set of rates.

The arbitrator then proceeded to establish rates which, in most instances coincided with the ones recommended by the engineers which in a few cases were higher or lower than the proposed rate. (15, pp. 160-1)

This is an excellent example of the interrelationships between the so-called "facts" of the job evaluation technique and the application of judgment. Although this case arose out of the problem of technological changes, the fundamental point that it illustrates, applies to any job evaluation effort.
Another pertinent point in connection with technological changes is the determination of, "when is a job a new job?" Some management-union contracts differentiate between procedures to be used for new methods and new jobs, especially if wage incentives are involved. In others, provision is made for handling changes in method and new jobs. This usually involves resorting to the grievance procedure and arbitration where the union does not agree with the rate established for the new method or job. In companies where a job evaluation plan exists, the description of the new or changed job can be examined in light of the detail breakdown by factors contained in the plan, and/or by comparing the new or changed job with previously evaluated jobs, factor by factor. The procedure facilitates a more objective approach to deciding significant differences between jobs. An example of such a case, in which an incentive wage system was installed in certain departments of a plant is reported by Copelof. The work (but not title or other exterior indications) of the timekeepers was materially changed in those departments requiring time records of incentive operations. The company felt no rate change was warranted, while the union did. The job evaluation aspects of this change (a technological change, according to listing given by Cooke and Murray, cited above) are noted by Copelof as follows:

The main points of difference involved how much should be given in the way of point allowances
The union pointed out there were several other jobs in the plant which had the same requirements, so far as these factors were concerned, and that these other jobs had been given higher point allowances on these factors. The company maintained that the timekeepers in the incentive pay departments were required to exert much less physical effort than the other timekeepers, and that the reduced physical demand should offset the higher point allowances for the two other factors.

The case was heard by a board of arbitration. The board disagreed with the company. It found that the reduced physical demand was not enough to offset the greater responsibility and experience required by the changed occupation. Accordingly, the board ordered that the timekeepers in the incentive-pay departments should be put into a separate classification and that their rate should be one job-grade higher than the rate paid the other timekeepers. (15, p. 155)

Lack of a job evaluation plan in the above situation would have made the presentation of the two sides less objective and not delimited to the particular phases of the job that were pertinent. On the other hand, the fact that there was two different views (company and union) indicates that the evaluation was not completely objective: that is, two different interpretations were possible. Management, of course, was motivated by the desire to hold labor costs down, whereas the union desired to secure advantages for its members wherever possible. Both parties were biased, but the area of dispute had been narrowed, and certain specific points were at issue, thus providing a more reasonable basis for decision by an impartial arbitrator. Recognizing all the technical deficiencies of job evaluation, the justifica-
tion for such a program receives considerable support from an analysis of the function performed in the above illustration.

From the foregoing it is clear that job evaluation, as a technique, must keep pace with technological developments and the social forces complementary to them. This is so if job evaluation is to be accepted by the parties involved, and is to stand up under the critical analysis of outside, but competent, researchers.
CHAPTER VI

JOB EVALUATION AND WAGE INCENTIVES

The Problem. The relationship of wage incentives to the established base rates creates an anomalous situation which has come to be regarded as one of the most serious problems in the whole field of wage determination. The usual statement is that wage incentives must be based on a sound program of job evaluation. Some writers have recognized that inequities can result from wage incentives, and Otis and Leukart (35) cover the problem with this paragraph:

Incentive systems, to be fair, must be based on the difficulty values of jobs. To pay the workers on a simple assembly job an incentive which makes their total wage equal to or in excess of the wages paid at the skilled level will endanger the success of the industrial relations program. A sound basic wage structure serves as a sentinel on guard against inequities. (35, pp. 390-1)

William Gomberg approaches the question more realistically, and points out its fundamental nature, both from the employee and management standpoint, as follows:

Incentive payment plans present peculiar problems of their own when used in connection with a job evaluation system.

The theoretical assumption of a wage incentive plan is that earnings can be divided into two elements: the base rate and the incentive increment.

Since there is assumed to be a more or less fixed relationship between the base rate and the incentive increment, the 'take home' wages of all occu-
pational groups of workers should reflect evaluated differences in the base-rate structure. In actual practice however, because of widely varying methods of setting production standards, some groups of skilled workers may earn less than unskilled employees. This in effect destroys the basic wage relationships.

There is no short-cut solution to this problem. If an attempt is made to right the situation by simply cutting the incentive rates of the less skilled workers to conform to the theoretical evaluated structure, both the evaluation and the wage incentive plan are likely to lose the confidence of the workers. The only sound solution to such a problem is a complete plant-wide review of production standards. (20, pp. 60-1)

There is record of various companies\(^1\) developing with great care both job evaluation and wage incentive systems in coordination with each other, and the incorporation of both plans in the Company-Union agreement. There is, of course, provision for handling grievances regarding inequities in either base rates or incentive-production rates. However, no provision is made whereby a skilled worker receiving day-rate pay can file a grievance because a semi-skilled employee on incentive production earns approximately equal total pay. In other words, assuming that the base rate structure (job evaluation) was equitable and "satisfactory" to all concerned, and that production rates and incentive opportunities were likewise adequately established on appropriate jobs, the problem.

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1 See, for example, an article by Hoyt P. Steele, Vice President, Benjamin Electric Manufacturing Co., "Company-Union Establishment of Job Evaluation and Incentives," American Management Association, Production, Series No. 185, April, 1949.
still remains. It is not clear, referring to Gomberg's statement quoted above, that the "only sound solution to such a problem is a complete plant-wide review of production standards," and just how such a "review" is to be used. He rules out "cutting the incentive rates of the less skilled workers" and since incentive earnings fluctuate considerably more than base rate ranges in many cases, it would be impossible to set a wage structure (even without lowering base rates) using the average or some other measure of incentive earnings for those jobs on incentive to be comparable with jobs not on incentive. Conceivably no union would agree to such an arrangement.

Example of City-Wide Wage Rates. To illustrate the exact nature of the problem, some data are taken from the U.S. Department of Labor, Bureau of Labor Statistics Bulletin Number 1096, Occupational Wage Survey for Cincinnati, February, 1952. (86) Reference is made to Table IX below. These data are for jobs included in the survey which are representative of those on incentive payment (in this example, class A jobs, highest of three classes are used) and are compared with a day rate job, "Tool and Die Maker." These data are also for several plants, so that the ranges and averages shown probably do not apply in any single plant.
<table>
<thead>
<tr>
<th>Occupation</th>
<th>Number of Employees</th>
<th>Average Dollars/Hour (See Note 2)</th>
<th>Average Dollars/Hour Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drill Press (Radial) T 155</td>
<td>I 60</td>
<td>1.54 1.35-1.85 (9)</td>
<td></td>
</tr>
<tr>
<td>Operator, A</td>
<td></td>
<td>1.97 1.30-2.50+</td>
<td></td>
</tr>
<tr>
<td>Grinding Machine T 134</td>
<td>I 61</td>
<td>1.65 1.35-1.95 (2)</td>
<td></td>
</tr>
<tr>
<td>Operator, A</td>
<td></td>
<td>1.86 1.35-2.50+</td>
<td></td>
</tr>
<tr>
<td>Milling Machine T 172</td>
<td>I 50</td>
<td>1.64 1.30-2.00 (2)</td>
<td></td>
</tr>
<tr>
<td>Operator, A</td>
<td></td>
<td>1.77 1.25-2.50+</td>
<td></td>
</tr>
<tr>
<td>Automatic Screw T 48</td>
<td>I 34</td>
<td>1.63 1.40-1.75 (7)</td>
<td></td>
</tr>
<tr>
<td>Machine Operator, A T 263</td>
<td>I 89</td>
<td>2.04 1.45-2.50+</td>
<td></td>
</tr>
<tr>
<td>Turret Lathe T 107</td>
<td>I 107</td>
<td>1.60 1.35-1.85 (1)</td>
<td></td>
</tr>
<tr>
<td>Tool and Die Maker (prod. shop)</td>
<td></td>
<td>1.81 1.35-2.50+</td>
<td></td>
</tr>
<tr>
<td>Tool and Die Maker (job shop)</td>
<td></td>
<td>2.04 1.75-2.50+</td>
<td></td>
</tr>
</tbody>
</table>

The percent increase of earnings of "job shop" Tool and Die Makers over the base rates of the other jobs shown varies from 24% to 32%, while the increase over the incentive earnings shown varies from 0% to 15%. The "production shop" Tool and Die Maker has even less advantage (or more disadvantage), with increases over straight time rates of 14% to 25%, and 0% to 4% increases over incentive workers. Probably more significant, is the relatively large number of incentive workers who received in excess of $2.50 per hour, as compared

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2 Note: Numbers in parentheses indicate total number of employees in that classification who received average total earnings greater than $2.50 per hour. "Inc." equals "Incentive."
to only one Tool and Die Maker. Although this is a city-wide sample, the higher skilled employees themselves are obviously aware of such circumstances. Again referring to Table IX, it was determined that average incentive earnings showed an increased over straight time earnings, for given occupations, of from 8% to 28%.

There is no information indicating the plants with or without formal job evaluation plans, and their position in such data as presented in Table IX above. However, for Operators A, it will be noted that there is rather close agreement in base rate (time) figures, both for hourly rates and ranges. The maximum difference in both (rates for range) is about 7%. The maximum difference between high rates for range is 11%. This close agreement would be on the order of agreement between jobs falling within the same wage bracket (with the possible exception of the Drill Press Operator) under a job evaluation program. The Tool and Die Makers would be placed in a higher wage bracket or classification.

The above illustrated situation can occur within an individual company whether job evaluation has been installed or not, because there will be base rates established by collective bargaining alone, or some other method of less formal nature. However, a job evaluation program has the advantage of equalizing the base rates of comparable jobs, so that with equal incentive opportunity, these comparable jobs will
produce relatively the same earnings. Otherwise, discrep-
encies between jobs of equal difficulty will be even more
disproportionate when incentive pay is included in the total
wage program.

A Company Example. An example taken from a specific
company (Sperry Gyroscope Company) will illustrate the de-
tail situation with actual rates. It will be recalled that
M. K. Lott's book, *Wage Scales and Job Evaluation* (27) was
based on the job evaluation plan installed at this same com-
pany in the early twenties. The present plan is an outgrowth
and development of Lott's pioneering effort, and has been in-
corporated into the 1950-1953 Hourly Unit Agreement between
Sperry Gyroscope Company and International Union of Electrical,
Radio and Machinery Workers, C.I.O. and Local 450, I.U.E.R.M.W.
C.I.O. (80). The following Table X shows the labor grades
with associated evaluation points and wage rates:
<table>
<thead>
<tr>
<th>Labor Grades</th>
<th>Points</th>
<th>Evaluated 4-16-40 to 4-15-51</th>
<th>Going Rates Dollars and Cents for</th>
<th>Going Rates Dollars and Cents for</th>
<th>Going Rates Dollars and Cents for</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>484-524</td>
<td>$1.27</td>
<td>$1.31</td>
<td>$1.35</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>525-564</td>
<td>1.32</td>
<td>1.36</td>
<td>1.40</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>565-604</td>
<td>1.37</td>
<td>1.41</td>
<td>1.45</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>605-644</td>
<td>1.43</td>
<td>1.47</td>
<td>1.51</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>645-684</td>
<td>1.48</td>
<td>1.53</td>
<td>1.56</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>685-724</td>
<td>1.53</td>
<td>1.57</td>
<td>1.61</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>725-764</td>
<td>1.58</td>
<td>1.62</td>
<td>1.66</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>765-804</td>
<td>1.66</td>
<td>1.70</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>805-844</td>
<td>1.72</td>
<td>1.76</td>
<td>1.80</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>845-884</td>
<td>1.79</td>
<td>1.83</td>
<td>1.87</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>885-924</td>
<td>1.84</td>
<td>1.88</td>
<td>1.92</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>925-964</td>
<td>1.89</td>
<td>1.93</td>
<td>1.97</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>965-1004</td>
<td>1.95</td>
<td>1.99</td>
<td>2.03</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>1005-1044</td>
<td>2.03</td>
<td>2.07</td>
<td>2.11</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>1045-1084</td>
<td>2.10</td>
<td>2.14</td>
<td>2.18</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>1085-1124</td>
<td>2.17</td>
<td>2.21</td>
<td>2.25</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>1125-1163</td>
<td>2.22</td>
<td>2.26</td>
<td>2.30</td>
<td></td>
</tr>
</tbody>
</table>

The Evaluated Points are determined by a "Joint Job Evaluation Committee consisting of ten persons, five designated by the Union and five by the Employer," based upon the Joint Job Evaluation Manual. This committee also decides related matters such as whether, in fact, "a new job has been or should be established." In regard to relative values, the per cent increase of the maximum point value, 1163, over the lowest, 484, is 141%. This percentage obviously would vary, depending on the value of the base point and the range.

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of points. However, the per cent range in points will remain constant over time for a given set of jobs. Comparable percentages for the three wage rate schedules are 75%, 72%, and 70% respectively. More realistically, the range from Grade 3 to Grade 15 representing the extremes, except for a limited number of jobs (only three jobs rated above Grade 15, for example), has a 100% increase on points (range of mid-points), but only a 50% increase in Going Rates, using the third period. Thus, if a Class B Gear Shaving Machine Operator (Grade 3), earned a 50% incentive bonus, he would receive as much pay as a Toolmaker, Class A (Grade 15), who is not on incentive. Although a 50% bonus is usually considered high, it is not necessarily a rare occurrence. This also is the case of what could be termed "top" and "bottom" jobs, so that for other jobs, not at or near the extremes of the range, a proportionately smaller incentive earning for the lower rated job would result in equal total earnings.

The National Problem of Wage Ranges. The above illustration from the Sperry Gyroscope Company Agreement, not only shows the results of the combination of base rates with certain jobs not on incentive and others subject to incentive pay, but the general trend of wage differentials between skilled, semi-skilled and un-skilled jobs. The dollar range, it will be noted, remained the same for all three periods (each ending in April of 1951, 1952, 1953 respectively), but
the per cent difference (expressed in per cent increase of the maximum figure over the minimum) decreased from 75% to 70%. Although this problem is not strictly the direct concern of job evaluation, the points, or whatever measure is used in evaluating jobs, do constitute a structure by which labor grades and rates are classified.

This situation results from equal money value "across-the-board" increases, and from the cost-of-living adjustment found in many wage agreements today. The problem is one of concern to both unions and management. The industrial type union draws the majority of its member from the unskilled and semi-skilled groups, thus the pressure is to raise the wages of these workers at the same dollar and cents rate as the skilled workers. However, recently the narrowing percentage differential has resulted in extra raises to skilled workers in certain industries, but not without reactions from the less skilled. Fortune magazine for October, 1953 (71) describes the development of the problem as follows:

Actually, the narrowing differential has been a long-term problem. In 1907, workers in three-fourths of the skilled occupations enjoyed wages at least 80 per cent higher than unskilled men in the same industries; and for one-fourth a differential of at least 180 per cent prevailed. By 1945-47 these figures had been reduced to 45 per cent and 70 per cent. To cite one dramatic instance

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of leveling, journeymen in the building trades averaged approximately 100 per cent more than laborers in 1912; by 1952 this had fallen to only 40 per cent more. Regional variations have been as important as those between industries. The South has always had greater differentials than other regions. In 1945-57, differentials between skilled and unskilled averaged 70 per cent in the south, but only 45 per cent in the Far West and 50 per cent in the Midwest.

Changes in the differential, as a study by the Twentieth Century Fund (Employment and Wages in the United States) indicates, derive principally from cyclical fluctuations in the demand for labor, which in the long run mean even more than federal policy. The first great leveling of differentials occurred during and immediately after World War I, when labor was becoming scarce. During the depression, the wage gap between skilled and unskilled workers widened, only to contract again in the years since World War II began. In a tight labor market, it appears from the study, the skilled workers suddenly find that they have lost their "normal" superiority of bargaining power over the unskilled men.

These shifts in differentials have an important consequence for management. Wage differentials within and between occupations are one of the important mechanisms in a free-market economy. They are one of the chief means of attracting skilled and trained workers, and represent a reward for the extra time spent in apprenticeship.

"From the viewpoint of administration of wages"—the report concludes "the narrowing of relative differentials between wages in skilled and unskilled occupations mean less opportunity to vary the rates of pay among occupations that become increasingly specialized and differentiated. In fact, the average spread of 55 per cent between skilled and unskilled manufacturing occupations in 1945-47 provides room for only a limited number of meaningful wage levels. In order to have significance, differentials in cents per hour doubtless have to be greater now than before the war." (71 pp. 116-118)
Group Incentives. Other than as indicated above, the relationship of job evaluation and wage incentives has generally received recognition as being a problem, but with rather vague proposals for solutions. Until more is known of the fundamental nature of both factors and their interactions, both from short-term and long-term viewpoints, solutions will be of the "practical" variety. There are, however, two or three areas, that more accurate information, based on research, should prove to be useful in attacking the problem. The purpose here is to merely refer to such areas rather than present a complete discussion. The first area is that of group incentives. The "group" would include the indirect workers who, nevertheless, make a contribution to the total production and productively of an integrated activity. The problems of measurement of units produced, standards, quality and lack of individual incentives are some of the obstacles to be overcome. As more and more industries tend to the process type and automation, group bonuses and incentives offer perhaps a partial answer to maintenance of high productivity and morale.

Separate Wage Structures for Incentive Jobs. Another area that offers possible approaches to the narrowing range of earnings between skilled, day work jobs, and unskilled and semi-skilled incentive jobs, is to consider these as two entirely distinct wage groups with separate but interrelated,
schedules. For example, a particular job might be placed in grade 5 by the job evaluation procedure. If a given operation is on incentive, the base for calculating earnings is a single rate (e.g., $1.35 per hour), while if work in grade 5 is on a day rate basis, the rate would be included in a range of $1.60 to $1.85. One management consulting firm defines the principle of this method in the following manner:

A single incentive base rate is established for each labor grade. In the use of all grades (except the lowest) this rate is below the minimum base rate for day work jobs in the corresponding labor grade. The location of the incentive base rate (is) established so that an incentive worker earning a bonus ratio of 30% would achieve a total earned rate that would exceed the minimum day work rate for a job in the same labor grade by about 10%. By this means the rate structure gives recognition to the generally higher level of productivity obtained on incentive jobs, but also provides a means of maintaining a reasonable relationship between the rate payable to a top day work performer and to incentive workers on comparable work. The resulting incentive rate structure is a course designed for use with incentive standards which contemplate a 30% bonus opportunity for the average qualified worker.

This particular proposal included a statement regarding day work jobs to the effect that the range of rates in each grade must be such to make it possible to recognize differences in performance and ability between individuals engaged in the same type of work. The range had a minimum rate, a maximum rate, and a midway point, the latter being the rate around

1 Name withheld upon request.
which most workers in a given grade would cluster.

Undoubtedly this type of relationship between dayrate and incentive jobs would require certain safeguards and conditions before being acceptable to a union for incorporation in an agreement. However, if such an approach is used, it is evident that a well developed and integrated program of time standards, job descriptions, personnel administration, production control and other similar functions would be essential. This problem highlights the fundamental importance of over-all management understanding of and planning for the various phases of wage determination and coincidental activities.
In previous chapters, the relationship of science to the development of job evaluation was presented. In spite of the contribution of science and the scientific method, job evaluation, both in theory and practice remains to a large extent an empirical phenomenon. The various systems were the result of practical men (empiricists) working out schemes to meet the immediate needs of pricing jobs in complex organizations. Trial and error was the rule, and the systems were adopted because they appeared to work, not necessarily because of a sound underlying theory. This is the way, however, that progress is made in many fields, and since, as it has been shown, human judgment enters into the job evaluation process, it was quite natural for the systems and principles to develop in this manner. One notes that “successful” bridges, standing today, were built long before the laws of mechanics were “discovered.” But the Golden Gate bridge would have been impossible under the same circumstances. Job evaluation is emerging from the “dark ages” of trial and error, and empiricism.

The sciences most directly concerned with job evaluation,
as already indicated, are psychology and sociology. If economics is a science, it should be included; however, a separate chapter is devoted to that phase of the subject. (See Chapter IV) It will be the purpose of this section to discuss the contribution of these sciences, and to analyze the research and experimental methods of each in regard to applications to job evaluation. Other sciences are concerned with problems of job evaluation, but less directly so than psychology and sociology. The fundamental approach is a "human" one. Although job evaluation purports to "measure" job content rather than the man on the job, the whole concept is limited and directly controlled by the capabilities, capacities and reactions to environments, physical and social, of the population of people who are going to fill the positions. Then, too, human beings are making judgments, ratings, rankings, etc., involved in the process of job evaluation, all of which is in the province of the social sciences.

I. HANDICAPS TO A SCIENTIFIC APPROACH

Physical Science Concepts Not Applicable. The scientific approach in a field such as job evaluation suffers certain handicaps. In the first place, many of the basic concepts familiar to the physical sciences are not applicable in the same sense, to job evaluation. Since it happens that engineers, mainly industrial, and other technically
trained persons, are often responsible for the development and operation of job evaluation programs, they do not find it possible to utilize procedures of the physical sciences, and therefore follow what appears to be a "logical" course. This technical background tends toward a "mechanistic" attitude, revealed by the appeal of the "logical," "systematic" point systems, and the tendency to accept "numbers" as scientifically accurate. With a bias in such a direction, it is difficult for technically minded people to recognize fully the significance of such elements as judgment, range and error that exist in job evaluation procedures.

Cost. A second handicap imposed by job evaluation on a scientific approach is that of the economics or cost element involved. There is no question but that the problem of wage differentials is complex. A number of forces are at work which must be analyzed and assigned proper weight and direction in order to determine the final effect. Some of these forces are traditional wage rates, supply and demand, technological developments, job factors as used in evaluation plans, attitude and "strength" of union and management, psychological and sociological environment and others. It can be readily envisioned that sufficient research to properly test hypotheses regarding all these factors would lead to prohibitive time and dollar expenditures, except in unusual circumstances. Therefore compromises are made, and
these involve difficult decisions. The compromise is between a rigorous scientific approach, and an acceptable approach, which will yield, however, less accurate and less consistent results. It will be the purpose herein, to examine the scientific method to determine, if possible, what techniques of science can legitimately be applied to the solution of job evaluation problems.

Lack of Acceptance and Understanding. Another drawback to the scientific method in connection with job evaluation, is the lack of its' (scientific method) acceptance by certain groups. The great majority of people do not understand scientific or research techniques, (although they are impressed by the "wonders of science") and if it happens that these techniques are used to help determine individuals' wage rates, the resistance may be difficult to overcome. This phase of job evaluation is extremely important. Any system, scientific or not, that includes methodology which bewilders union officials, evaluation committee members or even management executives, let alone individual workers, will find opposition forming against it. Such problems as have been mentioned must be recognized by anyone or any group attempting to approach job evaluation from a scientific and research standpoint. Education and time are two means which can be recommended to assist in overcoming problems of resistance,
compromise and ignorance. Thus it can be seen that some of the problems of the scientific method are human and not technical.

II. APPLICABLE AREAS OF JOB EVALUATION

Basic Concepts. Before discussing the underlying principles of the process of research, sometimes called "the steps in the scientific method," it would be advisable to distinguish the specific areas of job evaluation to which the scientific method is applicable. First, the area of the basic concepts of job evaluation, the fundamental theories and principles of wage differentials, without reference to any particular system or application, requires attention. Investigations in this area would be directed toward discovering and identifying the true determinants of job worth, questions relating to the psychological and sociological nature of "skill" and other so-called "factors," and their connection with objective measures of job differences; questions pertaining to employees' (those directly affected and those not) attitudes about wage differentials; questions of the economic, social and political forces involved; analysis of the postulates of job evaluation, such as "equitable wage structure," "relative job content," "measure of the job and not the individual on the job," and others; these are the questions about which hypotheses must be formulated
and tested, and conclusions drawn. This is the broad area, the general problems which are not directly concerned with one plan or one company, but with the theoretical concepts of job evaluation.

Specific Plans and Systems. The second area of research would appear to deal with the development of specific plans and systems. Research on a "before-and-after" basis, to determine significant differences in attitudes of employees, productivity, or other measures of performance, and for a number of different plans and installations, would indicate the relative merits or characteristics of plans and installations. Analysis of the factors of various plans, not only from the statistical standpoint, but from the standpoint of whether they actually measure job content, and whether other characteristics would also measure job content. Research in plan development and installation, with emphasis on use of psychological techniques such as rating scale construction, validation, and checking of reliability, enters this area. Questionnaire construction and use is another facet of this particular phase.

Job Rating Processes. The third area of job evaluation requiring research is the actual operation, or the rating of the jobs themselves, after a plan has been established. Problems of bias of raters, consistency of rating, internal
consistency of results, validity of results and other problems arising out of the use of job evaluation plans themselves fall in this category. Such research might reveal superiorities and defects of various plans, as they are tested by an external criterion.

The above three areas are defined primarily to point out the nature of research that is possible. The items mentioned are not by any means exhaustive, neither are they mutually exclusive.

III. THE SCIENTIFIC METHOD

Science, and the scientific method, make certain fundamental demands upon those who would operate under its name. Failure to meet these demands casts serious question upon the scientificness of the results obtained. Thus, it is of interest to determine the nature of the scientific method and its application to the areas of job evaluation stated above.

Definitions. Many definitions and concepts of science are available. Dr. James B. Conant (13) defines science in the following broad terms:

Science is a dynamic undertaking directed to lowering the degree of the empiricism involved in solving problems; or, if you prefer, science is a process of fabricating a web of interconnected concepts and conceptual schemes arising from experiments and observations and fruitful of further experiments and observations. (13, p. 106-7)
Dr. Conant is a physical, or natural scientist, an educator, profound thinker in many areas, and administrator of large and important undertakings in scientific, educational and government fields. He points out the interdependence of science and "common-sense" in-so-far as human being's everyday activities are concerned, by saying:

As guides to human conduct, common-sense ideas and scientific concepts interpenetrate to such an extent today that no one can say where one begins and the other ends. This is so obvious in regard to all the machinery that surrounds a civilized man that it requires no comment. (13, p. 110)

The acceptance of many scientific concepts into the social culture, and the general knowledge and interest in scientific achievements, has led to the use of the term "scientific method" in applications far removed from science. Dr. Conant (13) uses as an example the failure of an electric light bulb to light when the switch is turned on. The steps in the scientific method can be completely accounted for, including the establishment of a working hypothesis, in the activity of solving this problem. Obviously this is not science, but common-sense. Nevertheless, in the "scientific method," science has developed a working tool which can greatly aid in solving complex problems. Dr. Conant expresses the thought this way:

What is often defined as the scientific method is nothing more or less than an approximate description of a well ordered, systematized empirical inquiry. Now, systematized or well
ordered, empirical inquiries are one element in
the advance of science; the other element is the
use of new concepts, new conceptual schemes that
serve as working hypotheses on a grand scale.
Only by the introduction of a theoretical element
can the degree of empiricism be reduced. (13, p. 46)

Nature of Social Sciences. The social sciences fit
into this same pattern, utilize research methods, and the
"scientific method." The fact that these disciplines are
concerned with the mind, with interrelations between people,
and human behavioral adjustment and problems, rather than
the physical, natural world, indicates a different emphasis
and approach. For example, the social scientists who con­
duct research often are actually part of the population or
universe which they are investigating. Although the physi­
cal scientist must make important value judgments, he is not
as close to the ultimate effect of his research as is the
social scientist.

In the previous historical section of this thesis, it
was shown that the social sciences are relatively young. Dr.
Conant is of the belief that today these sciences are "in a
state comparable with that of biological sciences (including
medicine) a hundred or a hundred and fifty years ago." He
goes on to say that: "In attempting to appraise the advance
of social sciences as sciences, we are always in the same
difficulty as with medicine. It is hard to separate the
purely empirical from the scientific; it is impossible to be
unconcerned with immediate results and difficult to evaluate practical success or failure."

The degree of empiricism, then, is one indicator of the stage of development of a science. Empirical procedures, general speculation on ideas, and abstract or mathematical reasoning, can be said to form the ingredients of the scientific research activity. The proper combination of these elements will lead to formulation of general theories and laws, which according to Dr. Conant should be "policies for action." Dr. Conant also points out the role of the social sciences in relation to the idea of empiricism as follows:

All the sciences concerned with human beings that range from abstractions of economics through sociology to anthropology and psychology are, in part, efforts to lower the degree of empiricism in certain areas; in part they are efforts to organize and systematize empirical procedures. (13, p. 129)

That the procedures and precision of the social sciences may differ from the physical sciences is recognized, but also it is recognized that the application of the scientific method (research) in the social sciences is making important contributions to the improvement of human society. The constant refinement and development of research methods in the social sciences has led to increasing clarity of both theories and concepts, and subsequently to ever enlarging fields of activity for the social scientists.
In *Methods in Social Research* (21), Goode and Hatt define science as:

... *a method of approach to the entire empirical world, i.e., to the world which is susceptible of experience by man.* It is furthermore an approach which does not aim at persuasion, at the finding of 'ultimate truth', or at conversion. It is merely a mode of analysis that permits the scientist to state propositions in the form of 'if-, then-.' Thus, no matter how systematic any body of knowledge may be, it is not science if it merely begins with axioms, or 'self-evident' propositions, and ends with deductions from those axioms. (21, p. 7)

**Theory and Facts.** These authors (Goode and Hatt) further point out that, "Basic to modern science is an intricate relation between theory and fact," and define a fact as an "empirically verifiable observation," and that "theory refers to the relationships between facts." To further clarify the social scientist's basic concepts of theory and fact, Goode and Hatt outline the functions of each as follows:

Theory is a tool of science in these ways:

1. It defines the major orientation of a science, by defining the kinds of data which are to be abstracted;  
2. It offers a conceptual scheme by which the relevant phenomena are systematized, classified, and interrelated;  
3. It summarizes facts into (a) empirical generalizations and (b) systems of generalization;  
4. It predicts facts; and  
5. It points to gaps in our knowledge.

On the other hand, facts are also productive of theory, in these ways:  
1. Facts help to initiate theories;  
2. they lead to the reformulation of existing theory;  
3. they cause the rejection of theories which do not fit the facts;  
4. they change the focus and orientation of theory; and  
5. they clarify and redefine theory. (21, p. 8)
Thus, the foundations of the social sciences are fundamentally the same as the physical sciences, even though individual techniques may vary. Dr. William Foote Whyte (90) amplifies this latter statement with the following comment:

"... it is now coming to be generally recognized that we cannot build science in the social field by importing the methods that have proved useful in the natural sciences. Methods must be especially developed to deal with the types of data that are to be found in the behavioral field. This means that we are likely to get useful suggestions regarding possible methods from the older and more established sciences, but if we seek slavishly to imitate them our efforts will necessarily be sterile. (90, p. 4)

Mutual Dependence of Variables. Dr. Whyte, and others, have stated the bases of the scientific method in the social sciences, to clarify the procedure and also the nature of the conclusions reached. One concept commonly associated with research is the "cause-effect" relationship. Whyte explains that, "It [cause-effect thinking] was abandoned long ago in the natural sciences; and social researchers today are no longer proceeding on such a simple assumption of causation. "... We... refer to the mutual dependence among variables." This latter concept, and the statistical techniques developed to analyze the effects of a number of variables, has led to the development of significant new theories in the social sciences. What has just been said regarding mutual dependence of variables, implies changes in variables, which in turn implies quantification, or the measurement of the amount
and direction of change in the variables. Whyte warns, however, that "...we must not consider quantification as an end in itself. Nor must we assume that all quantification must be exact. In the present state of our knowledge we may be quite content if we can predict in rather general terms the outcome of a given social process. For such purposes rough measurements may be quite adequate and may, in fact, be the only measurements that it is practical to obtain." (90, p. 6)

Abstractions. Another concept basic to understanding social research is that of "abstract concepts" themselves. Concepts are necessary to "...classify the data of observation and selecting out particular aspects that we wish to examine; just as the physicist, for example, deals with weight, temperature, density and so on." (90, p. 4) In job evaluation, for example, abstract concepts are represented by such items as skill, responsibility, equitable wage structure, equal work, and others similar to these. The impact of such abstract concepts is revealed by Whyte when he states:

The process of abstraction then necessarily involves leaving out of consideration many aspects of the world around us that could conceivably be of significance. Since we cannot deal with everything at all times, this process of abstraction is necessary. There is always, of course, a real problem as to whether we are abstracting out of a situation elements that are sufficiently significant so that conclusions from our study will enable us to predict or control human behavior. If that
can be done, then the abstractions have demonstrated their use. If that cannot be done, then we must abandon the abstractions we have been using, or at least modify them, and embark on further tests. (90, p. 5)

Steps in the Scientific Method. Briefly, the steps in the scientific method, or research process, as conceived by social scientists is as follows:

1. Clarify and delimit the problem area, and define the problem. This should include exact definitions of pertinent concepts and a basic theoretical orientation in relation to the problem. This first step may also include exploratory work to observe and gather preliminary factual data, and describe the phenomena in the area.

2. Formulate hypotheses (carefully stated propositions derived from previous exploratory investigations, or theories) which can be tested to determine their validity. Hypotheses must be subject to such tests that the procedure of the test can be repeated and yield the same conclusions. Also hypotheses must be stated so that the theoretical framework is clear and can be logically utilized, and that it will be within the capabilities of available research methods to be tested.

3. Develop the research design, or the experimental design, to test the hypotheses. There are a number of types of experimental designs, some of which are listed below:

   a. The "method of agreement..." holds that, when two or more cases of a given phenomenon have one and only one condition in common, then that condition may be regarded

1 The writer is indebted to Dr. Robert P. Bullock, Department of Sociology, The Ohio State University, for use on an unpublished report in which the essentials of the research process are discussed.
as the cause (or effect) of the phenomenon."
(2, p. 74) This also can be stated negatively.

b. The "classical" experimental design, also known as the "method of difference," usually involves the use of a control group and an experimental group, in which a condition is changed in the latter, and the difference in the reactions of the two groups is noted.

c. Concomitant variation involves studying two or more variables, retaining, or not, the control group idea of the classical design. Correlation and factorial analyses are utilized to determine degree of association between variables.
(Note: the above types can be varied and modified to meet different conditions and hypotheses. For a complete discussion see Goode and Hatt, Methods in Social Research (21).)

4. Conduct experiments by collecting data and analyzing the data. The methods and techniques used must be suitable for the hypotheses and design of the experiments, and must be tested to ascertain that they are sufficiently reliable and valid to meet the requirements of dependability. Some of these procedures will be discussed below.

5. Formulate conclusions based upon the evidence and testing of the hypotheses. The preparation of a clear, concise report is an essential of this final step.

It should be kept in mind that the conducting of a research experiment, or a project which utilizes the scientific method, is not an end in itself, but the basis, or policy, for action, the formulation of new or revised theories, or the rejection of previous theories, or the broadening of the scope of a theory into new areas of the problem.
IV. TECHNIQUES

In relating the basic approach of science to job evaluation, especially the phases of it referred to above, certain assumptions are made. The first of these is that the techniques and methods developed and used by the scientists in psychology and sociology are scientific. Secondly, that the problems of job evaluation are analogous to, or are a phase of, certain areas in these social sciences, and can therefore be treated in similar manner. The two social sciences to be considered in detail for their contributions and research methods are psychology and sociology.

Job Analysis. Psychology has made the largest contribution to job evaluation, mainly in regard to job analysis. The term "job analysis" has a number of connotations. To the industrial engineer the term is used in connection with methods improvement, the work activity, work place arrangement and other physical aspects of the job. This involves identifying the various types of motions made in the performance of an operation, and arranging all these motions and other elements of the operation into the optimum pattern. The whole purpose is to improve the efficiency of the operation in terms of time and cost. No great emphasis is placed on the problem of the physiological and psychological characteristics of the operator in relation to the requirements of the job, although it is recognized. Nor is any
The psychologist is primarily concerned with job analysis in connection with employment, that is, the selection, placement, transfer, promotion and guidance of employees. Viteles (52), for example, is concerned with job analysis in reference to the procedures employed in gathering information about work activities and their requirements in the way of personnel, regardless of whether vocation, occupation, or job is the unit under observation.

The general approach of psychological job analysis is first, to determine the "traits" or abilities required for specific jobs, occupations or vocations. Abilities have been classified into several groups with sub-divisions within groups. In addition to required abilities, the psychologists are also interested, perhaps predominantly so, in capacities or potential abilities. The following items may be considered as applicable, but with different emphasis, to either abilities or capacities:

**Mental ability or intelligence**
- Memory
- Attention
- Association
- Reasoning or logic
- Verbal or abstract intelligence
- Mechanical intelligence
Mechanical (motor) ability
- Dexterity
- Muscular coordination
- Accuracy or precision

Personality traits
- Self-control
- Sociability
- Caution
- Shyness
- Meticulousness

The above items are not a complete listing, but are typical of the traits required of, or found in, people on jobs. Viteles (52) developed the "Job Psychograph" which listed 32 items of psychological nature which were graded on a five point scale from "negligible" to "of utmost importance," to designate which of the abilities were necessary for success on a particular job. Samples of such items are:

- Rating of discharge
- Initiative
- Alertness
- Visual Discrimination
- Auditory Discrimination
- Tactual Discrimination
- Accuracy
- Memory (Visual, Auditory, Tactual)
- Observation
- Intellect
- Judgment
- etc.

The job psychograph is used in connection with the job description and specification to give a more complete "picture" of the job to facilitate selection of employment tests, training, etc. It is noted that the items on the job psychograph are not weighted such as are the factors used in the
Tests. One of the most important general techniques developed by industrial psychologists is the testing or measurement of abilities and aptitudes. When a particular trait, or set of traits, is determined to be necessary or desirable for a job, or occupation, a test is devised to measure proficiency in that ability or abilities, or more often, aptitudes for acquiring skill in the particular traits which make up the job. For example, tests have been designed to measure "dexterity," the theory being that a person (applicant for employment, for example) who scores high on such a test, will succeed on a job calling largely for manual dexterity. Of course, it is seldom that one test is given—usually a battery of tests of different types is administered.

To validate the tests, persons who are successful performers (or some other objective criteria may be used) on given jobs are also given the tests. Their scores are analyzed, and those tests which show a high reliability and validity, are used as a basis for selection, placement, transfer, etc. There is, to be sure, much more to the whole field of psychological tests for industrial and business purposes.

However, other than as a source of possible factors, and as an invaluable aid in developing job specifications, job evaluation techniques have not relied to a great extent on
this particular approach. In other words, there have been few attempts at direct transfer from the job psychograph, or other trait battery, with scores or profiles for specific jobs, into an evaluation of the relative worth of these traits in terms of wages or salaries.

Viteles (52) refers to the job classification plan developed by J. O., Hopwood (23) and discussed previously herein, which used general intelligence as a basis for classifying occupations. However, Hopwood also used general grade classification descriptions which included skill, observation, learning time required, responsibility, etc. Some of these factors are not included in the job psychograph or other psychological traits generally included for testing.

**Merit Rating.** Another important subject in the area of industrial or employment psychology is "merit rating." As will be shown, the theory and procedures of merit rating more closely approach that of job evaluation than does job analysis as discussed above. Merit rating is often cited as a complimentary technique to job evaluation — the latter designed to "rate the job," the former to "rate the man." However, Burtt (10) points out that a number of the principles of testing, rating scales, etc., and particularly the statistical techniques involved, might well be adopted in job analysis, and as a matter of fact, such is the case.
Thus noting the similarities and relationships, both in principle and specific content, between job analysis, merit rating and job evaluation, it will be the purpose here to examine in more detail some of the techniques, statistical and otherwise, used in merit rating and job analysis as they might apply in job evaluation.

The first general area of interest is in regard to the bases of job evaluation. By definition the area is limited to the internal relationship of base rates for the range of jobs within a given organization. The basic theory is that if job evaluation techniques are properly used, then an equitable internal relationship will be derived. It is proposed to discuss "equitable" and criteria at a later point, thus leaving for the present discussion the basic techniques used in accomplishing job evaluation.

Ranking and Status. The first technique is ranking. Psychologists have long used rankings of various types in experimental work, and the technique is well established. Further, it lends itself well to "common-sense" applications and is a familiar every-day process. People's whole lives consist of making (subjective) rankings. The specific procedures and statistical techniques are ably discussed in such references as that by Otis and Leukart (35) and Kendall (25) which also indicate the advantages and disadvantages. There
is no doubt that ranking of whole jobs is a subjective procedure, with definite limitations. Otis and Leukart point out that: "Since he (the rater) is asked to keep the "whole job" in mind when sorting the jobs according to worth, he is apt to be influenced by such factors as present rates, quality of persons on the job, and prestige value. It is very difficult in judging the "whole job" to keep a consistent point of view. Different raters use different bases for their judgments, thus invalidating some of the ratings." Others objections to ranking are (1) that equal degree of difference between ranks is assumed, which may not be the actual case, (2) handling more than about twenty items (jobs) often imposes an impossible situation on the rater - he is asked to make discriminations below his threshold, and (3) usually there are not enough competent raters, in order that all items (jobs) can be rated by all raters.

These objections and disadvantages must be view in light of the objectives of job evaluation. The item of "present rate," for example, may also be the "traditional rate" for the job, the ignoring of which may lead to difficulties in collective bargaining, and also ignoring it may not be realistic in view of the fact that it also will influence other types of ratings. Certain job evaluation plans such as the factor comparison method and the Cooperative Wage Study evaluation plan of the steel industry actually utilize present or
traditional rates as a basic element of the plans. As will be discussed below this latter plan embodies many of the best research techniques, and also proved to be acceptable to the United Steelworkers of America, (C.I.O). It would appear that further evidence regarding this factor is necessary before rejecting the ranking method on this basis.

Another factor referred to by Otis and Leukart is "quality of persons on job." This would seem to violate one of the basic rules of job evaluation: "rate the job and not the man." Assuming that the rater knew personally, or otherwise, the people occupying jobs, it is impossible in any situation for raters to equally "blank out" or divorce people from consideration of the job. One of the objections by labor unions and others of job evaluation is its neglect of the personal element in jobs. Such a bias on the part of raters could easily be detected in the ranking method by comparing individual rater's judgments by means of rather simple statistical methods. Once such a bias is determined to exist, then three things can be done: (1) The ratings can remain, with the understanding that the biased figures are there, (2) after additional training, the rater can re-rate the jobs, consciously avoiding the previous error, or (3) the ratings may be adjusted statistically.

"Prestige value" is definitely a subjective concept, although sociologists have performed many studies on prestige
status associated with various occupations. Miller and Form (29) report several studies conducted over a period of years starting in 1925. The general conclusion reached is that: "Occupation is perhaps the most important factor which underlies the status structure of both the community and industry. Status tends to accrue to occupations almost independent of the people in them." In general occupations are usually ranked as follows:

1. Professional and semi-professional workers.
2. Proprietors, managers and officials.
3. Clerical, sales, and kindred workers.
4. Foremen, skilled, and kindred workers.
5. Operatives, apprentices, and semiskilled workers.
6. Unskilled workers and laborers." (29; p. 368)

Another phenomenon reported by Miller and Form is, that people tend to rate their own occupation higher on the scale than do people in other occupations. For example, clerical workers ranked their occupations above manual workers', and vice versa. A very pertinent summary of the factors, tangible and intangible, affecting occupational prestige is given by Miller and Form as follows:

When workers are asked why certain jobs deserve more esteem or respect, they tend to answer, 'men have respect, not jobs. Some jobs are more important than others but all should be equally respected for all are needed.' When pressed for reasons underlying the relative importance of jobs, they usually reply that some jobs demand more skill, greater responsibility, a longer training period. Sometimes this is an objective fact which can be proved by direct observation or by job-evaluation techniques. Not infrequently, however, no discernible reason, can be found for status distinctions.
One concludes that tradition decrees that some jobs should have more prestige than others; or that some jobs borrow prestige from association with others. For example, two supervisors in a department store may have similar jobs with equal duties and responsibilities. One may supervise the kitchenware department, the other the jewelry department. The latter usually has greater prestige because he associates with higher-status customers and clerks. This 'halo effect' is also seen in the personal servant's sense of superiority over the yard servant. Sometimes even this tenuous basis for a job's prestige cannot be found. One job is more honorable simply because people say it is.

Income and property are fundamental factors underlying status structure of work plants and communities. Contemporary Western culture is materialistic, and it tends to measure social honor in economic terms. To many people, 'success,' status, and money are one and the same thing. They tend to believe that the fact of wealth is more important than its origin. With some notable exceptions, then, occupations which are associated with greatest monetary return also have the highest status. A 'better job' is a higher-paying job. (29, pp. 369-70)

If status, or prestige, is such an important factor in relation to jobs, and "almost independent of the people in the..." as pointed out above, it would seem that any concept of "equity" must certainly be influenced by status. It is also important to note that a "cause and effect" relationship does not exist between status and monetary return (wages, salaries, etc.), but a contingent relationship, with the two factors correlated.

This phase of job relationships (status, prestige values) suggests an area for additional research, and testing individual organizations by the techniques of psychology and
sociology. Miller and Form (29) refer to job evaluation techniques as a probable means of determining "reasons underlying the relative importance of jobs," thus placing the rate structure developed by job evaluation as the criterion. This criterion may not be acceptable to all groups concerned, especially to labor unions which insist on negotiating the final rate structure. The position taken by the writer is that the criterion for the job evaluation scale might reasonably be a job status scale as developed by tested psychological and sociological research methods. Goode and Hatt (21) present a complete survey questionnaire used by the National Opinion Research Center to interview a selected sample of the population regarding attitudes toward occupations. Although the questionnaire and interview procedure were designed to collect data on attitudes of the entire population of the country, a similar form and procedure could be designed for use within a given organization. The procedure of the above mentioned survey was not specifically ranking, but placing the occupation in a designated category on a ten degree scale.

An experimental method associated with ranking, but one that yields more accurate results, is that of paired comparisons. If not too many items (jobs) are involved, this method is not too cumbersome or unwieldy, and the resultant rankings can be assigned values with varying differ-
ences between them. This means that the scores can be converted into labor grades or other scale, on a realistic basis.

Most job evaluation procedures do not provide for testing the results with a criterion (although wage survey data may be considered criteria). This may not appear a necessary step in those cases where the values developed by the procedure are only a basis for negotiation. Even so, in these cases, the desirability of a criterion, from the standpoint of accurate and valid values, might prove justified. The possibility of utilizing a second method, such as ranking, which is simple to administer and analyze, as a criterion should not be overlooked. If certain results do not prove consistent by this type of criterion, and are also suspect with reference to data obtained in a wage survey, either the system used or the particular jobs in question should be carefully reviewed. If the entire scale of values shows good agreement, both with the ranking criterion, and an external criterion such as community rates, the probability is high that the scale of values (job ratings) is valid. Much more confidence can be placed in such results and certain of the mechanics of the procedures, especially joint committee work, can be reduced to a minimum. Otis and Leukart's criterion of grievances might be applied as experience is gained with the job evaluation plan, but this is an ex post facto criterion, whereas the ones referred to above can be applied before the plan is formally adopted.
Another advantage of the ranking, or questionnaire-interview method, when used to validate job evaluation procedures by another plan, is that a much larger sample of raters in relation to the total population (all the personnel in a given organization) involved can be taken conveniently, than is possible with the point rating or factor comparison systems. The use of judges in these latter systems has disadvantages in being a small sample, being a non-representative, non-random, highly selective sample, and probably subject to the same biases. This situation can be visualized when the committee of job raters has been selected by management, usually from people in managerial or supervisory positions. In those cases where a joint company-union committee operates, or where evaluations are reviewed by a union committee, the final results will tend to be more valid.

In discussing ranking as a job evaluation method, consideration should be given to the fact that, as indicated above, people have a subjective concept of job hierarchy. In any job evaluation plan, this concept will influence ratings. The high correlations noted between several factors (as in studies by Lawshe (64) for example) may be attributed to the fact that each of the factors is in reality measuring the same thing; or that the raters are consciously, or unconsciously, assigning point values, for example, in such a manner that those jobs pre-conceived as being high in rank.
order will receive a relatively large number of points. In so far as research is concerned, this particular phase would offer a fruitful field of study. The implication is that simple "whole-job" ranking will yield as reliable and valid results as will the more complicated "objective" systems. Authorities such as Otis and Leukart (35) state, for example, that, "With the use of certain safeguards...it is probably as accurate a method of classifying jobs as any other system."

It is to be noted that the factor comparison plan utilizes ranking, but jobs are ranked one factor at a time, usually about five factors being involved. Furthermore only key jobs, and not more than fifteen or twenty of these, all of which are known to the judges, are selected. The reliability of these ratings can be determined by the test-retest method. Once scales are established for key jobs, other jobs' characteristics can be compared factor by factor to assign appropriate values. Previously in this thesis (see pages 196-7) it was shown that actual ratings assigned to key jobs for the five factors involved did not represent the weights intended because of the distributions of the ratings. An analysis of the rankings of the key jobs indicates that the factors (Physical Requirements and Working Conditions) with low standard deviations - indicating little or no relative influence on total rates - are the factors which have low or negative correlation with the other three factors.
(For example, the product-moment correlation between the rates for Mental Requirements and for Physical Requirements is -0.447 in the sample plan previously discussed. The correlation between Mental and Skill Requirements is on the order of 0.95, and between Physical Requirements and Working Conditions, \( r = 0.53 \), and between Mental Requirements and Responsibility \( r = 0.92 \).) This means that the two factors which were to balance out or compensate for the Mental-Skill, Responsibility type of factor, actually did not. Further, this method (factor comparison) requires that irreconcilable discrepancies between results of the ranking be resolved by discarding those jobs (as key jobs) when the ranking does not agree with the established wage scales rate. This appears to be something less than objective, and assumes that the current wage rates for key jobs are correct. It should be pointed out that in actual operation this assumption is not always strictly adhered to. For example, community wage levels and rates may be used as a basis for the rates of the key jobs rather than the company's own rates.

**Errors.** Recognizing that the types of errors discussed above may appear in any specific installation, but to varying degrees, it would be of more than academic interest to investigate the nature of the procedure and results of a representative sample of installations, and also test the validity by utilizing one or more different methods of job classification.
tion or an exterior criterion such as average community rates for comparable jobs. The reliability of results from factor comparison plans can be more readily determined by the test-retest method. Increase in reliability can be achieved by training of raters, more complete and accurate job descriptions and specifications, experience, checking biases of raters statistically and making necessary adjustments, and judicious selection of raters. Cross-checking of jobs by factor and point or rate value and by departments will also serve to determine internal inconsistencies. Since, in considering that the fundamental purpose of job evaluation is to establish equitable relationships between jobs within an organization, this problem of reliability assumes more importance than validity. And further, since the usual procedure is to make "adjustments" where two parties or more cannot agree on a certain rate or procedure, the lack of statistical accuracy may not be the largest "error" that can be introduced into the system. This would indicate that research would be in order to determine the causes of the differences between the rates obtained by job evaluation and the final rates resulting from negotiation.

Classification. Brief mention will be made of the "job classification" or "grade description" method of job evaluation. In the first place there is no quantification, unless assigning grade numbers and grade salaries is quantification.
The entire process is a subjective, verbalized one. However, by considering the entire structure as one rating scale, certain techniques, such as "equal appearing intervals" may be applied. This technique will be discussed subsequently in detail. Thus, if a series (should be a relatively large number) of job class description statements, properly formulated and edited, are judged by a group of "experts" placed on one of a number of scale values, and the mean and quartile deviation values calculated, it is entirely possible to construct a meaningful and accurate job rating scale. Specific job descriptions can then be matched with the class descriptions for assignment to a specific grade. This latter can be done by a committee to minimize biases and other errors.

One of the difficulties encountered in the classification method is the fact that usually more than one scale will have to be constructed. That is, a scale for clerical jobs, a scale for shop jobs, a scale for professional and administrative jobs, etc. may be required, since it will be impossible, realistically, to devise descriptive statements which will fit all these categories. Then the problem arises of assigning appropriate dollar ranges to the respective grades and major categories. However, this problem is not basically different from assigning dollar ranges under other job evaluation methods.

Another difficulty encountered in the classification method is that a particular job description will contain state-
ments which fit into two or more grade descriptions. There is no quantitative measure or breakdown as in other types of systems to help solve this dilemma. Thus it becomes a matter of judgment and agreement. It is well to note, however, that in the quantitative systems, the rating of jobs on a number of factors does not always result in the placing of specific jobs where the actual rating of individual factors would indicate.

"Whole-job" Versus Component Part Analysis. Consideration of the classification system, and some of the concepts discussed in regard to ranking, indicates the types of mental processes involved in job rating. Basically, there are two types: (1) "Whole-job," and (2) by component parts. The ranking and classification methods utilize the "whole-job" approach, whereas the factor comparison and point rating methods utilize the component part idea. There is no question that jobs themselves can be classed by component parts - number of people supervised, dollar value of material held responsible for, length of time required to attain skill, existence of heat, cold, fumes, etc., and many other familiar items - but do people conceive of jobs as being compartmentalized, even when objectively (supposedly) analyzing them? The main justification of the quantitative systems is that such factor-by-factor analysis objectifies the process, and a closer approximation of a job's real worth is determined
All the evidence points to the increased reliability of judging "parts" rather than "wholes." One example from a somewhat analogous situation will serve to illustrate the point. Viteles (64) reports several research projects in connection with interviewing where the comparisons were between those interview situations in which the interviewer gave a single judgment (fit - unfit) and interviews where several traits or qualities were judged. Both the reliability and validity of the first type were low. In one case however, by use of carefully prepared definitions of several qualities and objective rating scales, correlations of the results of two independent interviewers averaged .60 for simple traits and .55 for complex. Viteles concludes, "that it is far easier to procure consistent, or reliable estimates of character qualities when the qualities are defined and when a standard scale is prescribed for rating these qualities." (52, p. 176).

The judging of job worth has certain aspects in common with interviewing, in that usually certain factual data (e.g., application form) is available for study at the time the subject is under observation. Frequently, a committee member in job evaluation will have no prior personal knowledge of the job and must base his judgment on the data presented, and perhaps discussion of the job by those better
Research in a number of areas, and experience both have demonstrated the greater reliability of the component part procedure. Yet, it is interesting to note the comment Otis and Leukart make in regard to the classification type of evaluation:

After a firm has completed a job evaluation by means of some method other than grade description and has set up a series of classes or labor grades, it is relatively easy to build a grade-description scale. In fact, many firms do have a verbal description for each labor grade and in time tend to think of jobs in these terms. For example, referring to a job as 'grade 5 level' or as a 'class 2 job' is a method of conveying the meaning of job difficulty and job worth to others. When an organization begins to think of its jobs in terms of grad-description levels it is beginning to use job evaluation in a way which aids salary and wage administration. For those who have had machine-shop experience and who are acquainted with skill-trade classifications, the terms Machinist A, Machinist B, and Tool Maker A have real meaning and convey an idea of job difficulty, job content, and job worth which would be desirable for all positions in the organization. The grade-description method tends to integrate this type of meaning into the job-classification structure more quickly than the other job evaluation methods. (35, p. 69)

If a conclusion can be drawn from the above brief analysis, it would be that people do think of jobs as wholes, but can, with a fair degree of consistency, judge individual elements, if carefully defined, etc. However, this latter process is influenced to a certain extent by the general, or whole-job, concept. In terms of factor analysis, (the statistical procedure), it might be said that a general factor is operating in conjunction with the other elements of
Judgment. The fact that such studies as Lawshe's showed high loadings on a number of factors which could be associated with Skill, for example, indicates that there is probably a general factor influencing the judgment of ratings. That this general factor is the "whole-job" concept, is a distinct possibility.

Job Descriptions and Specifications. Two principal psychological techniques (ranking and rating-scale construction) have been discussed in connection with three types of job evaluation plans: ranking, classification and factor comparison. Before proceeding with an analysis of point rating systems, one point should be made. In every case, the requirement for complete, accurate, standardized job descriptions and specifications is of paramount importance. These descriptions and specifications can be approximately of the same type and construction no matter what plan is used. They constitute a factual record of the job, and the success of any evaluation program depends to a large extent upon the excellence of these factual data. Not only is effective job evaluation dependent upon these items, but also many other programs such as organizational planning and control, selection, testing, placement, transfer and promotion of personnel, wage surveys, personnel budgets, and many others. The size and complexity of the company will determine the extent of formalizing required. It is obvious that
in connection with job evaluation programs, the job description - specification phase must be integrated with the specific job evaluation plan. For example, in the classification method, the job descriptions should cover and express the same characteristics as used in the grade descriptions. In job analysis leading to development of tests, emphasis may be placed on phases not emphasized in determining job worth.

**Point Rating.** The point rating type of plan, as has been mentioned, is the most widely used of all formal job evaluation plans. It more nearly typifies "job evaluation" as conceived in industry than other types of plans. In conception and operation, point rating systems closely resemble merit rating, or performance evaluation, plans, although there are some important differences. In both cases, specific traits, characteristics, or factors, are selected as a basis for rating either individual jobs or individual persons. There are, of course, a variety of merit rating techniques, among which ranking is an important one. In this discussion, however, the reference is to the technique most commonly found, and that is the graphic rating scale, with a continuum, or levels, defined and quantified for each of the several traits.

In both merit rating and point systems of job evaluation the selection of factors is of prime importance. A discussion and treatment of factors, by psychological and sociolog-
ical methods is also of interest. Frequently, the job evaluation procedure involves adopting exactly, or modifying slightly an established plan. This has the advantages of being quick, economical, "tested," and easy to sell, especially to management. Obviously, accuracy and validity are sacrificed, and rating difficulties may arise by virtue of the fact that the factors and degrees are not realistic in the particular situation. Other subjective methods are often used, such as discussion in committee or a particular "pet idea" of the top management, for selecting factors and assigning weights to them. A consulting firm is frequently hired to do the job, and in most cases, these firms utilize a particular plan of their own, or one such as the NEMA plan.

Thurstone: Equal Appearing Intervals. Opposed to the above methods are two procedures developed by psychologists and/or sociologists, mainly used in performance rating, attitude testing, or job analysis and testing. The first of these, already mentioned, is the method of "equal appearing intervals" of Thurstone.

This technique could be applied to a specific organization for job evaluation purposes by selecting a large number (probably about 300) of statements regarding job
characteristics which have been carefully edited to avoid ambiguities, etc., and to include references to all possible job characteristics that might be meaningful, and could be rated objectively. The statements are grouped by appropriate factors (or this can be done by the judges to check specificity of meaning at time of sorting, or grouping can be eliminated, placing statements on one scale, sorting later) and then each statement placed by each judge on the proper scale division to indicate relative value of the statement. The final selection of statements would then constitute the basis for a schedule of factors and degrees. It is quite possible that certain factors would not prove satisfactory because suitable statements could not be found for the entire range of values, or there was not agreement concerning which factor to assign statements, or other such reason. In such cases, this would be evidence that the factor did not meet one of the criteria discussed in Chapter III, Principles and Fundamental Characteristics, and thus would be excluded.

The problem of quantifying the factors and degrees (statements) is a difficult one at best. In the above described procedure, (Thurstone's equal appearing intervals) if the scales on which statements were sorted had five divisions, these could be assigned values of 10, 20, 30, 40, 50, for example. If a particular statement had a mean of 15.2, a value of 15 could be assigned and this used as degree one or
two as the case might be. This procedure would result in a random progression, but one more justifiable than arbitrarily placing values of 5, 10, 15, 20, 25 as the final degree values. The Thurstone technique should be completed by actually rating sample jobs, before finalizing the scales.

Weighting. The problem of weighting the various factors arises at this stage. The relative importance of each factor actually is what people think the relative importance should be to the over-all worth of jobs. Tiffin (47) reports that "a fair weighting of their (the factors') relative importance was decided through discussion and consideration by management and supervision, in the case of selecting a number of apprentices for training. Four factors were used and assigned percentage weights. The Z-scores from tests and records were multiplied by the weightings to arrive at the final score. Following this line of reasoning, the procedure in the job evaluation program would be to decide by vote, union-company committee, or other method, the weightings (or relative values) that represent what the people involved think the weightings should be. If there is a wide disagreement on any particular factors, such factors should be discarded.

\[^1\] Z-score or standard score is each score expressed as a deviation from the mean in terms of multiples of the standard deviation of the original distribution.
As individual jobs are rated by a committee on the basis of the original values, obtained, for example, by the "equal appearing interval" method, the Z-scores are calculated, and the sum of these Z-scores will be the final point rating of the job.

The above method should, of course, be checked with a group of key jobs against the criterion of the jobs rated by another method, or methods, such as ranking, wage survey results or other.

If the Thurstone technique is used, two alternatives appear possible. One would be to segregate statements and their corresponding scale values into factors as suggested above. This would accomplish a weighting, but would force a decision by the rater for each factor. The other possibility is to leave the statements in a listed, random order. Each statement then would be checked, if applicable to the job in question, by the raters, the total of the checked statements' weights being the final value of the job.

Tiffin (47), in discussing the problems of merit rating and weighting of factors states that: "...if the merit rating chart is so set up that it is necessary to rate each individual on a number of specific (weighted) points and then to determine the total merit rating from some combination of these several ratings, it is quite likely that an over-all result not compatible with the facts will be obtained." He
further points out that the halo effect may actually "be the saving grace" of such systems, by causing ratings to follow an over-all impression. Tiffin then recommends, "The use of a single over-all trait called job performance as a criterion..." and comments that certain companies have solved the weighting problem and component part-rating by use of a dual system: first, rating on over-all ability, and second, by a factor-by-factor rating. The parallel to job evaluation problems is evident. From the applied standpoint, many of the procedures for detecting and correcting biases and distributions, providing criteria, and similar functions, developed in merit rating research, is of immediate value in job rating. In addition, further research into similar problems specifically associated with job evaluation would produce valuable theories and facts on which to base improved procedures.

V. RESEARCH

Several important pieces of research have been conducted to date in job evaluation and the remainder of this chapter will be devoted to discussion of these, and some conclusions regarding research and the scientific method.

Steel Industry Job Evaluation Plan. Probably the outstanding examples of applied job evaluation research is the instance of the development of the Cooperative Wage Study evaluation plan for the steel industry during and shortly
after World War II. To understand the significance of this research project, it is necessary that the bases for the plan be stated. First, the concept of the four components of wage rates and the philosophy of wage determination was as follows:

1. The average level of wages in the community or the labor market.
2. The difference between the ends of the wage structure or its slope; that is, the difference between the rates paid for unskilled labor and for highly skilled labor.
3. The relative value in each job of the individual job characteristics; such as, skill and responsibility.
4. The deviation of any actual individual rate from the amount that would be determined by the forces working in 1, 2, and 3.

This deviation is the so-called 'wage-rate inequity', and that is the only one of the four components of a wage rate which job evaluation is concerned.

The philosophy of wage determination which is presented here is founded upon the belief that existing rates form the only basis for the determination of correct rates. (78, p. 38)

The last statement does not mean that existing rates were the correct rates, but formed the basis for correct rates. It also means that a criterion was selected, and this criterion had the advantage of being quantified. Thus the validity of results could be determined, which as has been previously pointed out, is usually not a feature of other job evaluation plans and applications. The internal consistency of the final results was also determined by cross comparison, but in the development of the plan, reliability was given special attention by a large number of re-ratings and testing of three types
of job evaluation plans. Thus, the entire project was conceived and carried through by following scientific research principles and procedures.

Before discussing the research procedure, it should be mentioned that the twelve large steel companies cooperating in the project provided whatever funds, personnel, assistance, time and equipment that were needed to accomplish the task. Complete freedom was given the group to develop the "best means of wage determination and the solution of the ever-present wage-inequality problem." The only stipulation was that the solution had to be practical and simple so that union representatives could understand and use it. Nearly two years were spent in planning, research and development before the plan was finalized. It is evident that the cost of this type of research and development is prohibitive for any but the largest organizations, or combinations of large organizations. Smaller companies or institutions can find little solace in the specific, detail results of the project because one conclusion was that the plan, as developed, applied only to jobs of the type covered by wage agreements with the steelworker's union, and did not apply satisfactorily even to clerical jobs in the steel industry. The implication here is that any plan must be designed to fit the individual company, or highly integrated industry, and cannot give the same type of results if used in another situation. However, several important
conclusions of general, theoretical value were derived and these add materially to the body of knowledge pertaining to wage-rate inequities and job evaluation.

The completeness of the research is evidenced by the procedures used, and which, it will be noted, conform to the steps in the scientific method outlined above. In order to fully explain this important research, there has been reproduced in Appendix B, a considerable portion of Paul M. Edward's presentation "Statistical Methods in Job Evaluation" which appears in the Proceedings of the Second Annual Management Engineering Conference, College Station, Texas, March, 1949. (78)

Salient points and conclusions that can be derived from the Cooperative Wage Study are as follows:

1. Applied research methods can be used effectively to develop job evaluation plans. In the past the preparation of job evaluation plans has been largely an empirical procedure. However, the mathematical and statistical tools are now available to determine within known limits of validity and reliability such elements as factor weights and weights of degrees within factors, best method of defining degrees, number of factors and other similar features of job evaluation plans.

2. The steps in the development procedure:
Step 1: Select the field of jobs to be covered.
Step 2: Select the most likely factors and define them.
Step 3: Select a sample of jobs representative of the field.
Step 4: Describe the jobs (including qualifications by factors).
Step 5: Rank the jobs in each factor.
Step 6: Group the job rankings into degrees.
Step 7: Rank the jobs in total by their rates.
Step 8: Group the total job rankings into labor grades.
Step 9: Solve for the weight in labor grades of each degree in each factor.
Step 10: Define each degree in each factor in terms of work elements.
Step 11: Assemble a working evaluation manual.
Step 12: Organize for and execute the evaluation program and provide for its long-term continuation.

It will be noted that steps 1 through 8 are similar to those used in developing factor comparison and/or point rating plans. However, the above procedure only arrays the facts and data which are the basis of the statistical analysis which follows in steps 9 and 10.

3. The use of a wage structure as a criterion is a logical assumption, and provides an acceptable quantified basis for determining the validity of job evaluation results. The wage structure must be one that has been in existence for a long enough period of time to reflect the forces of supply and demand, technological changes and bargaining of rates, and be reasonably stable. Obviously this important feature of the procedure depends to a large extent on the judgment of management and the union.
It would appear highly desirable to select some such outside criterion. For example, this idea is approached in the factor comparison method by the use of the rates of key jobs, chosen as being already acceptable to all parties.

4. The acceptability of the plan to the steel companies, and to the union, is a type of validity determination. It is noted that William Gomberg in, "A Trade Unionist Looks at Job Evaluation" (62) commends the plan as, "The most significant job evaluation plan in use today," and states that, "The validity of the plan is based upon the satisfaction of collective bargaining experiences."

5. The curvilinear nature of the weighting of degrees within factors, derived by mathematical and statistical methods referred in Appendix B brings out a number of essential points. First, such weights accurately reflect the differentials of difficulty and so on, between degrees. Each factor has its own equation, with weights progressing at different rates, some in a straight line, others curving sharply. Next the problem of the narrowing ranges of wage rates between unskilled and skilled workers, discussed in Chapter IV, Economic Aspects of Job Evaluation,
appears soluble to an extent, by virtue of the fact that the higher end of the scale the labor grade values increase proportionately more than at the lower, tending to keep skilled jobs' rates at a greater differential. In other words, the basic labor grade scale recognizes the real condition of job differentials by use of curvilinear weights.

6. The steel companies' plan raises some questions that require analysis. First, could this be a pattern for research in other industries such as automotive, aircraft, electrical equipment, machinery, rubber and the like? A qualified "yes" is indicated, with the qualifications being that a cooperative, free environment must exist, that only jobs of comparable nature (such as selected by the steel companies' group) be included, and that the thoroughness of the analysis be comparable to the procedure discussed therein. Second, can the smaller, independent, organization benefit from the research, and utilize the methods involved? Again, a qualified "yes" is the answer. Although the advanced statistical techniques may not be feasible for various reasons, there are simpler procedures available, which, if correctly used, will give indications of the type obtained by more elaborate methods. For example,
standard deviations of ratings on a sample of key jobs will indicate the relative effect of each factor, and assist in reducing the number of factors required for evaluation. Graphical solutions to determine curvilinear relationships of degree values may require more theoretical research before being used for specific plans, but they offer the possibility of close approximations to the statistical methods. This is especially true if the criteria of an existing, acceptable, wage structure can be assumed.

Another question is raised by Patton and Smith (36) in regard to the problem of traditional, geographic and industry differentials as they affect such wide-spread plans as the Cooperative Wage Plan. The point made is that such uniform plans are cumbersome and impracticable, especially if each plant is not given considerable autonomy. The method employed by the steel companies' research group utilized the above mentioned differentials and integrated them into the job factor and degree definitions and weights. Although the plan established grades for "benchmark" jobs, the specific evaluations are developed and rates are negotiated within each bargaining unit. The fact that the weights and definitions of degrees and factors were determined by the
research process described herein, gives them validity and reliability over the range of jobs covered and from which the research sample was drawn. If a given steel plant is not representative of the entire population, or if jobs other than the types included in the sample (such as clerical jobs) are included in an individual plant evaluation, satisfactory results will not be obtained.

7. There are, of course, many observations possible regarding the administration and operation of the plan. However, this is somewhat beyond the scope of the present discussion, inasmuch as it is limited to the research phases of this plan.

The Lawshe Studies. In the area of "pure" research ("pure" in sense that the investigators had no immediate practical objective in mind, as was the case of the steel company project discussed above) the work of Dr. C. H. Lawshe, Jr., and his associates at Purdue University, is outstanding. The studies are reported in detail in several volumes of the Journal of Applied Psychology (63-69 inclusive) and have been continuing since 1944.

The general hypothesis upon which Lawshe, et al., based their research was that if a few (approximately three) factors are used in a point type evaluation system, that the results will not differ significantly from results obtained by using
many (10-15) factors. Most of the Lawshe experiments were based on installations of the NEMA plan, or slight modifications thereof. As can be seen from the hypothesis stated above, the experiments had to do with determining reliability. The researches did not include validity analysis, since no criterion other than total points was selected. Also no investigation was made of the *a priori* selection and weighting of factors, definition of degrees, or effects of rater bias, although a test-retest study was performed to show reliability of successive ratings.

The principal techniques employed were (1) factor analysis by the Thurstone centroid method with rotation by the zeters and Van Voorhis method, (2) the Wherry-Doolittle shrinkage selection method, and (3) product moment correlations.

In Lawshe's first study (63), a factor analysis was performed on job ratings in three plants. The factors in the plans (NEMA) were as follows:

1. (TOTAL POINTS)
2. Education
3. Experience or Learning Period
4. Initiative and Ingenuity
5. Physical Demand
6. Mental or Visual Demand
7. Responsibility for Equipment
8. Responsibility for Material
9. Responsibility for Safety of Others
10. Responsibility for Work of Others
11. Working Conditions
12. Unavoidable hazards

After the intercorrelation matrices were factor analyzed,
and loadings determined, a total of five main factors emerged, not more than four of which applied to any one plant. The following Table XI gives these loadings by factor for the three plants. The item numbers correspond to the factors listed above.

**TABLE XI**

**Item Loadings By Basic Factors for Three Plants**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Plant A Loadings</th>
<th>Plant B Loadings</th>
<th>Plant C Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Items</td>
<td>Items</td>
<td>Items</td>
</tr>
<tr>
<td>------------------------------</td>
<td>------------------</td>
<td>------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>I. Skill Demands</td>
<td>1.976 3.915 3.969</td>
<td>2.904 2.865 2.729</td>
<td>2.867 2.697 2.518</td>
</tr>
<tr>
<td>II. A Job Characteristics</td>
<td>2.976 3.915 3.969</td>
<td>2.904 2.865 2.729</td>
<td>2.867 2.697 2.518</td>
</tr>
<tr>
<td>IIIB. Job Characteristics</td>
<td>2.976 3.915 3.969</td>
<td>2.904 2.865 2.729</td>
<td>2.867 2.697 2.518</td>
</tr>
<tr>
<td>IIIC. Job Characteristics</td>
<td>2.976 3.915 3.969</td>
<td>2.904 2.865 2.729</td>
<td>2.867 2.697 2.518</td>
</tr>
<tr>
<td>III. A Job Characteristics</td>
<td>2.976 3.915 3.969</td>
<td>2.904 2.865 2.729</td>
<td>2.867 2.697 2.518</td>
</tr>
<tr>
<td>IV. Attention Demands</td>
<td>2.976 3.915 3.969</td>
<td>2.904 2.865 2.729</td>
<td>2.867 2.697 2.518</td>
</tr>
</tbody>
</table>

Plant A was given as an aircraft engine manufacturing

---

2 Numbers correspond to factors listed on page 307.
plant with the operations consisting mainly of machine opera-
tions producing engine parts. Plant B was identified as an
airframe assembly plant where welding, assembly work, rivet-
ting, etc. were performed. Plant C was a small calibre
ammunition loading plant where tending of machines and inspec-
tion constituted the principal operations.

The relative proportion that each Factor contributes to
the evaluation of jobs was determined by squaring the total
k's. For example, in plant A, Factor I, the k for Totals is
.944. This squared equals (approximately) .90, and .3222
squared equals (approximately) .10. Thus, under the plan,
Skill Demands accounts for 90% of the total evaluation of
jobs. Table XII summarizes these totals:

<table>
<thead>
<tr>
<th>PLANT</th>
<th>I</th>
<th>IIA</th>
<th>IIIBC</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>.90</td>
<td>.10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>.99</td>
<td>.01</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>.775</td>
<td>.005</td>
<td>.19</td>
<td>.03</td>
<td></td>
</tr>
</tbody>
</table>

In further factor analysis studies by Lawshe on plans
such as point systems modified from the NEMA plan, salary rat-
ing plans by NEMA, and factor comparison plans, results com-
parable to the above were obtained. Other researchers such
as D. J. Chesler, R. C. Rogers, and Philip Ash using similar
methods, obtained results which led to the same conclusions.
In another phase of the studies by Lawshe, the Wherry-Doolittle shrinkage selection method,\(^1\) was used to determine which one factor, two factors, three factors, and so on produced the highest correlations with the total point ratings. By multiple correlation techniques, the regression equation for predicting total points was derived for plant A (same Plant A referred to above) as follows:

\[ X_{tp} = 30.4 + 1.4^{\text{exp}} + 5.4^{\text{haz}} + 2.0^{\text{Educ}} \]

The point ratings for each of the three factors (Experience, Hazards, Education) for each of 247 jobs that previously had been evaluated were substituted in the equation and new ratings obtained. The deviations from the original ratings are shown in Table XIII, taken from Lawshe (64):

<table>
<thead>
<tr>
<th>Points Deviation</th>
<th>Same Grade</th>
<th>One Grade Difference</th>
<th>Two Grades Difference</th>
<th>All Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4</td>
<td>68</td>
<td>9</td>
<td>77</td>
<td></td>
</tr>
<tr>
<td>5-9</td>
<td>48</td>
<td>27</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>10-14</td>
<td>20</td>
<td>28</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>15-19</td>
<td>11</td>
<td>21</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>20-24</td>
<td>6</td>
<td>2</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>25-29</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>30-34</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>35-39</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>153</td>
<td>92</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

|                  | 62%        | 37.2%                | 0.8%                |

In another study conducted by Dr. Lawshe (64), five jobs were rerated by the standard job evaluation (NEMA) system, at three intervals separated by several weeks. The mean difference in points assigned to the jobs was 71, which equaled approximately $0.05 in hourly rates. However, between the second and third ratings, the mean change was 24 points, and $0.02 respectively.

Lawshe concludes that the deviation between ratings arrived at by the use of three factors is practically unimportant in terms of magnitude of range within labor grades, flexibility of the wage schedule, and the probable unreliability of the ratings in the first place.

The general conclusion reached in these studies by Lawshe and others, is that the hypothesis stated above cannot be rejected, that is, results obtained by (properly constructed) abbreviated scales will not differ significantly from the results obtained by conventional, or longer, scales. Lawshe also makes this important point, "It is clear that the extent to which each item or factor contributes to the total cannot be determined by inspection of the scale alone, and the end result may yield results different from those intended by the makers of the scale." (63)

The question has been raised by Otis and Leukart (35, p. 98) and others, as to the procedure for developing a satisfactory abbreviated rating scale without already having
a complete scale and evaluation data to start with. To answer this Tiffin (47) reports a study conducted by himself and M. K. Davis in which a prediction equation similar to the one given above was used in eight different installations, where no previous research had been conducted. Tiffin summarizes the procedure and results as follows:

Three of the eight installations were NEMA plans, and five were modified point systems. The three factors used were experience, initiative and ingenuity, and hazards. The correlations obtained between total points and points predicted from the three factors are summarized in Table 12.7 (Table XIV herein). For each of the three NRMA installations, the three factors used yielded correlations of .94 or higher with the total points from the entire set of factors. Four of the five point systems that were not NEMA plans the corresponding correlations were .91 or above. For only one of the eight installations studied (Company 5) was the correlation too low to justify predicting total points from the abbreviated scale. This one company was a public utility and was using a job evaluation system which included factors quite different from those included in the NEMA plan.

It would thus seem that an abbreviated system does give essentially the same results as a longer system, and the short system does not need to be developed specially for every point where it might be applied. (47, p. 387)

The table referred to above is reproduced on the following page.

In a study of reliability by Lawshe and Wilson (86), forty jobs were rated by twenty experienced job analysts, first by the NEMA plan, and then by an abbreviated plan using four factors determined by previous factor analyses. A total of five analysts rated each job, independently, by the two
TABLE XIV

Correlations Between Total Points Predicted From Three Factors in Eight Job Evaluation Installations

<table>
<thead>
<tr>
<th>Company</th>
<th>No. of Jobs</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 1 NEMA</td>
<td>341</td>
<td>.96</td>
</tr>
<tr>
<td>No. 2 NEMA</td>
<td>126</td>
<td>.95</td>
</tr>
<tr>
<td>No. 3 NEMA</td>
<td>605</td>
<td>.94</td>
</tr>
</tbody>
</table>

Non-NEMA Point Systems

<table>
<thead>
<tr>
<th>No.</th>
<th>Factors</th>
<th>Jobs</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>12 factors</td>
<td>61</td>
<td>.98</td>
</tr>
<tr>
<td>5</td>
<td>11 factors</td>
<td>77</td>
<td>.69</td>
</tr>
<tr>
<td>6</td>
<td>10 factors</td>
<td>185</td>
<td>.96</td>
</tr>
<tr>
<td>7</td>
<td>11 factors</td>
<td>273</td>
<td>.96</td>
</tr>
<tr>
<td>8</td>
<td>23 factors</td>
<td>253</td>
<td>.91</td>
</tr>
</tbody>
</table>

methods. The correlation for total points on the forty jobs by the NEMA plan was .77, and by the abbreviated plan, .89. "Stepped up" reliabilities, (reliabilities that could be expected if the means of the five analysts, working independently, were used consistently) were .94 and .98, respectively. Not only were the total correlations higher, but also the reliability for individual factors was higher. For example, Working Conditions showed correlations of .54 and .85 (obtained and "stepped-up") in the NEMA plan, and .61 and .89 (respectively) in the abbreviated.

The general conclusion by Lawshe and Tiffin is as follows:

In the light of these findings - that job evaluation systems consisting of only a few factors give essentially the same results as systems involving many more factors, and that a shortened system is at least as reliable as a longer system - it would seem

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1 From Tiffin, Joseph, *Industrial Psychology* (47, p. 387)
advisable in the future to make greater use of systems considerably shorter than many that are in current use. (47, p. 393)

Aside from the technical statistical phases, certain questions remain to be answered regarding the studies and conclusions just discussed. First, it is recognized that such scales as the NEMA plan as weighted and used, do not represent independent measures of job worth, but form "clusters" in which two or more scales measure essentially the same thing. Thus, as shown in Table XI above, the following scales (factors) were analyzed as measuring "Skill Demands" for Plant A:

- Education
- Experience or Learning Period
- Initiative and Ingenuity
- Responsibility for Work of Others

Mental or Visual Demand
Responsibility for Material
Responsibility for Equipment

It is noted that the loadings ranged from .400 to .976. However, in Plant B, "Responsibility for Safety of Others" and "Unavoidable Hazards" also appeared under Skill Demands, and in Plant C, only four items were grouped as measuring Skill Demands. Also, it is noted that items 12, "Unavoidable Hazards," and 9, "Responsibility for Safety of Others," appear under Skill Demands

Job Characteristics
Job Characteristics, Hazardous
This situation indicates that Skill Demands mean different things in different plants, and also that in view of the arrangement and loadings of factors, that a sizable portion of each scale (factor) remains unexplained by the common factors that appeared. This type of analysis further emphasizes that job factors, used to measure job content and worth are not additive. The two or three reliable and stable factors (according to Lawshe) are not sufficient in themselves to form a job evaluation scale. The unexplained portions suggest that other elements or factors are present, and which are only partly or inadequately measured. And these latter cannot be identified by a subtractive procedure. It would appear then that more factors are necessary in the original job evaluation plans in order, by research with factor analysis, to isolate and identify the other determinants of job worth.

Another question that arises, is the extent to which interpretations of definitions and job descriptions affected the results of the research reported by Lawshe, et al. Tiffin (47) remarks that in connection with the reliability study by Lawshe and Wilson (68), "The greater reliability of the shorter scale is probably due to the use of more carefully worded descriptions of the degrees of the various characteristics, rather than to the mere fact that a shortened scale is being used." None of the studies have shown the amount of error or discrepancies due to this element (better
descriptions, etc.). It will be recalled that the Cooperative Wage Study by the steel industry (78) did include this important element in its research and arrived at some definite and significant conclusions. (See Appendix B)

In regard to abbreviated scales (which are not the same instruments as scales built with cluster factors), if the criteria of homogeneity, mutual exclusiveness, cumulative exhaustiveness, practically meaningful and readily quantifiable are to be applied, it will be observed that there is less validity than with a longer scale. The shorter scale as used in the factor comparison system is not as guilty in regard to the above criteria, as such shortened scales as those with factors similar to the following from Lawshe and Wilson (68):

<table>
<thead>
<tr>
<th>Learning period</th>
<th>Working conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>General schooling</td>
<td>Job hazards</td>
</tr>
</tbody>
</table>

From the standpoint of acceptability by workers, unions, job analysts and raters, and management, the use of three or four factors in a point type system is questionable. Gomberg and other unionists take strong exception to the NEA plan in particular, and certainly this opposition increases with fewer factors, even though their statistical reliability can be proved. The research people who developed the steel companies' plan also point out objections to reduced number of factors, even while recognizing the technical merits of such reduction. Management often feels that the inclusion of such factors as "Responsibility for the Safety of Others," or
"Responsibility for Relations with Others," has a desirable "psychological" effect on employees.

To conclude this discussion of the Lawshe, et al., studies, two quotations are presented. William Gomberg (62) rather tersely comments: "...I submit that this (Lawshe's first studies) is proof that the NE/M/A experts simply do not know what they are doing. It is for this reason that I am unable to understand the purposes of some of the other studies conducted by Lawshe." (62, p. 4). Gomberg feels that the conclusions reached by Lawshe are "trivial." In the study by Lawshe, Dudek and Wilson (69), a statement regarding validity is significant:

No conclusions about validity can be drawn from this study (of abbreviated scales) due to lack of suitable criterion. ...Although short job evaluation systems consisting of only a few items may be statistically and logically justified, it may be practically advantageous to include additional items in the system which will make it more acceptable to raters and employees. (69, p. 123)

It is, of course, inappropriate to classify these studies and conclusions as "trivial." However, it is apparent that more research is needed in connection with some of the more fundamental assumptions of job evaluation.

Internal Consistency Scales. An important technique developed in connection with sociological studies and research, and based on the work of Thurstone and his method of "equal appearing intervals," is that of "internal consistency
scales. Complete presentations of these methods can be
bound in Murphy and Likert's Public Opinion and the Individual, and Rundquist and Sletto's Personality in the Depression
(40). These methods do not use judges (raters) as in the
Thurstone method, but use a series of carefully selected and
tested statements, each of which is scaled by a measure of
intensity, such as "strongly agree," "agree," "uncertain,"
"disagree," and "strongly disagree." The statements and re-
ponses can be weighted either by applying the standard devia-
tion of the distributions on the statements, or by a logical
weighting, based on the content of the statement and assign-
ing values from 1 to 5 to the intensity terms. Goode and
Hatt (21) point out that results from many cases indicate no
significant difference between the two methods, (i.e., stand-
ard deviation - Z score, and logical weighting). Correlations
in these cases ranged from .953 to .995. To summarize the
procedure of this method, the following paragraphs are quoted
from Goode and Hatt:

Having made the point that the arbitrary
method of weighting responses is an adequate scor-
ing technique, it is now possible to return to the
application of the criterion of internal consistency
to item selection. When the scale has been admin-
istered to the first sample of subjects (at least
100; and even larger number is desirable) each item
should be scored on the 1-5 scale. These scores
should be totaled and divided by the number of items
in the scale. The resulting average item score for
each individual should be entered on the top of his
sheet. This average item score can then be corre-
lated with each of the actual item scores. The
simplest technique for this is the tetrachoric coefficient of correlation from the computing diagrams, which may be found in standard statistic textbooks. The items may then be ranged in order from high to low in accordance with the value of the coefficient of correlation. Those with low coefficients should be discarded and the selection made from the remainder.

Note, however, that the size of the measure of internal consistency alone is not the only criterion to be employed in selection, since this is ultimately only a measure of reliability. The final scale of 15 to 18 items should also (1) contain approximately as many favorable as unfavorable items, and (2) contain a wide range in each type of 'weak' and 'strong' statements. (21, pp. 274-5)

The possibilities for application of the above and similar attitude scale techniques to job evaluation have not been explored to any extent, if at all. Yet it would seem that such techniques could be useful in developing more meaningful job evaluation scales. The following is merely suggestive of one area that might be investigated.

Previously in this thesis it has been mentioned that research into the job characteristics that are determinants of job worth has been meager. Most studies, such as those by Lawshe, assumed that the factors used in the plans studied were in fact the true determinants. To investigate this problem objectively, a large group of people with knowledge of jobs, either in one plant, or several related-product plants, would be asked to submit statements, each of which expressed a characteristic of a given job. Several statements pertaining to a variety of jobs would be secured from
each of the participants. After a screening and editing process, either the same or another group of participants, would indicate on the intensity scale for specific, individual jobs, their opinion as to whether the characteristic was present, and to what degree. Using the weights determined as described above, a total value for each job could be obtained. The intensity scale terms might be modified to meet the particular requirements of job evaluation. For example, instead of the "agree-disagree" type of item, an "apply-not apply" series could be used.

The results of such an investigation could be used to assist in building a point rating scale, or could be used directly to evaluate jobs. Referring to the discussion of the steel companies' plan in which elaborate, advanced statistical techniques were used, it is conceivable that comparable results might be obtained from a study on a small scale, utilizing the internal consistency method just described. This latter technique should give about the same type of results as the Thurstone equal appearing interval technique, with the added advantages that a shorter scale is used and judges are not required.

A similar approach to that of the item selection, internal consistency method, is that of item analysis. This method subjects the responses to each statement (on a five item intensity scale such as in the item selection procedure) to an analysis of the top and bottom quartiles to determine
the statement's discriminating power (DP). These DP's are then arranged similar to the coefficient of correlation of the internal consistency method as one of the criteria of items selection. A DP of 1.00 is preferable, with few, if any, falling below 0.50.

Conclusion. This chapter has endeavored to present some of the problems of job evaluation that are amenable to research and investigation by the scientific method; to discuss two major efforts of research in job evaluation; and to explore briefly additional research techniques developed by psychologists and sociologists that hold promise of advancing the knowledge of job evaluation.

That job evaluation principles and practices have developed almost entirely by empirical means is not to its', or to the developers', discredit. Difficult problems arose in a field that traditionally utilized empirical (and even irrational) methods. Procedures had to be found that were logical, systematic and relatively simple, and at the same time acceptable to divergent groups. To paraphrase Dr. Joseph Tiffin (47) in his remarks about the values of merit rating, it can be said that, "Regardless of a number of criticisms, statistical and otherwise, that may be directed against job evaluation, industrial managers are coming to recognize, more and more, certain values inherent in such a system." It can be concluded, definitely, that job evaluation has inherent
values that render it a valuable part of the total area of industrial and business operations, especially in the realm of wage and job differentials. Assuming this to be true, it is all the more reason to subject job evaluation procedures and underlying assumptions to the methods of scientific research in order to establish theories and facts that can be used to predict results with greater assurance and accuracy.
CHAPTER VIII

SUMMARY AND CONCLUSIONS

Summary. Job evaluation might be said to be an expression or an answer of the last 50 years, a period of rapidly advancing industrial and technological developments, for the age old phenomenon of wage differentials. It has been defined, in operational terms, as "... the ranking, grading, and/or weighting of essential work characteristics of all jobs or job classes in some systematic way to ascertain the labor worth of each job or job class relative to all others." (1, p. 1105) A number of different systems, or plans, with many variations of each, are in use, not only in industry, but in every type of activity in which wage differentials and administration is an important consideration. Although accurate figures are not available, it is estimated that at least one-third of all companies utilize some form of systematic wage differential determination. The use is more prevalent in larger companies, where job characteristics and relationships are more complex, than in small.

From the earliest times wage differentials have been in existence. Although conditions have changed, there are certain attitudes or habits of thought which have persisted to the present day. One such attitude is in regard to menial, manual labor. This idea is aptly expressed by Barnes (3), and he points out that the idea of predatory versus productive
activity, that is, aggressive warfare and economic exploitation (predatory) attained "invidious and honorific distinction," while useful and productive labor (associated primarily with manual work) was considered relatively base.

For many centuries slavery was a predominant element in the economic life of most countries (and apparently still is in some). The cost of purchasing and maintaining a slave became the standard or criterion upon which wages for common labor was based. It must be remembered also, that until recently, the vast majority of work consisted of simple manual tasks involving the application of strength and endurance; there was no mechanical or electrical power. Earnings, or wages, of free men in ancient society, feudal society, and under the guild system, were determined primarily by what the article they produced could be sold for - the law of supply and demand. Economic life was essentially a local affair during the periods just mentioned, with trade a difficult and hazardous undertaking.

The guilds, a development of the Middle Ages (although prototypes existed in classical Greece and Rome), consisted of three classes; or categories: the apprentice, the journeyman and the master. This arrangement has persisted until today in the craft type unions. The apprentice, under the original concept, received no pay but was trained in the craft. The journeyman received wages, which frequently were
determined by the local guild organization, and the master was the owner of the business. Status distinctions grew up regarding the various guilds, with higher honor being placed with those guilds, or crafts, in which "brain work took precedence over manual work." The guilds became powerful politically and economically. All these factors had an effect on the relative earnings or wages of workers in these early periods. In addition, from about the fourteenth century on, governmental controls were exercised in connection with wages. At first, these controls were local, with the guilds either directly or indirectly responsible. However, in England in 1562 the Statute of Apprentices established certain regulations concerning work and wages for the entire country. Subsequently, other laws were passed setting up more rigid restrictions on workers and in 1799-1800 a law was enacted to forbid the combination of journeyman.

In the eighteenth century, the transition into the period which marked the beginning of the Industrial Revolution brought about a breakdown of the traditional guild system as a dominant force in the political and economic life of western countries. The factory system, new concepts of economics, with Adam Smith as the chief prophet, expanding trade and the rise of a new country on the American continent, transformed the role of the workers from that of a member of a small integrated unit, to an impersonal item in the employ of an impersonal corporation. The rise of "capital" and "labor" was
inevitable, as were the conflicts, sometimes violent, between these two classes.

Although technology and division of labor advanced, the determination of wages remained a matter of individual negotiation between owner and employee, or between union and company representatives, with the pressures of supply and demand, opportunistic raising and lowering of wage rates, company or union power, or other equally random or irrational forces determining the outcome. However, in the 1920’s a method was devised to give semblence of orderliness and logic to the problem of determining relationships between rates to be paid the various jobs within a given organization. This method became known as “job evaluation.” It is not intended to convey the idea that job evaluation has replaced individual or company-union negotiations. The results of the evaluation procedure furnish a basis of systematically determined rates upon which negotiation can be carried on more intelligently. Nor is it intended to imply that the results of all job evaluation efforts are “correct” or even acceptable to the parties involved.

Job evaluation, generically speaking, can look to two developments which began prior to the 1920’s for much of the foundation and trends of it own development. One of these was the so-called “Scientific Management” movement, initiated by Frederick W. Taylor before the turn of the century. The
The technique of "time study" was originated by Taylor, in which each job, or operation, is analyzed into its component parts for the purposes of improving the operation and setting a standard time for its performance. Although the time study analysis of jobs is for a somewhat different purpose than determining base rates for the jobs, it did demonstrate that jobs, especially industrial production jobs, could be broken down into segments for a more detailed and objective investigation of their characteristics.

The other development referred to above was that of "job analysis." This type of analysis was the concern of the industrial psychologists, who were interested in the characteristics of jobs and work from the standpoint of the worker. Concepts such as individual differences, abilities and capacities to perform certain types of tasks, monotony and its effect on workers, safety and related items, were subjected to scientific experimentation and theories were propounded. Such techniques as employment tests (covering phases of intelligence, manual dexterity, visual acuity, trade knowledge, etc.), interview procedures, training methods and merit rating fell within the purview of the industrial psychologist. Job analysis is a basic tool of many of the above listed techniques, and usually includes such features as description of job duties, existence and extent of job characteristics which in turn required the possession of certain traits by the
individual worker, general working conditions, and other pertinent data useful in constructing and administering tests, devising training procedures and similar psychological techniques.

The job evaluation evolution then took place along lines similar to the two developments just outlined. One of the first plans was conceived by M. R. Lott (27) at the Sperry Gyroscope Company. This was a "point" plan, as are the majority of installations in existence today, in which those job characteristics which were felt to be determinants of relative job worth, were assigned a weight, or point value, to represent the particular portion of the total weight that individual job characteristic represented.

The Federal Government and many municipal and other public bodies felt the need for an orderly, systematic procedure to establish wages and salaries. The Classification Act of 1923 (75) provided:

...for ascertaining and recording the duties of positions and the qualifications required of incumbance, and it shall prepare and publish an adequate statement giving (1) the duties and responsibilities involved in the classes to be established within the several grades, illustrated where necessary by examples of typical tasks, (2) the minimum qualifications required for the satisfactory performance of such duties and tasks, and (3) the titles given to said classes. (75, p. 5)

This was the basis for the classification system in the Federal service, in which jobs were assigned to specific grades by virtue of a comparative analysis between the job descrip-
tion and grade or class description. This type of job evaluation is found principally in public organizations, although a few industrial companies use it.

A third general type of job evaluation system is known as "factor comparison," and generally the credit for developing this type goes to Benge, Burke, and Hay (6), who published their Manual of Job Evaluation in 1941. However, as early as 1927 this type, or a plan similar to it, was in operation. The principle of the factor comparison system is to rank a group of "key" jobs on each of four or five broad factors, adjust the ranks to the wage rate for the jobs, and then use this key list ranking, and money value assignments, as the basis for a comparative analysis of all other jobs. It is noted that this method utilizes ranking, which if used to evaluate jobs as a whole, constitutes a separate type of job evaluation system. Thus, there have developed four types of job evaluation methods:

- Ranking
- Factor Comparison
- Classification
- Point Rating

Certain principles, or fundamental concepts, are inherent in job evaluation procedures. These will be discussed briefly at this point, and commented on further under Conclusions. The first principle is, of course, that there are definite differences and levels of job worth in the whole
population of jobs, or segments thereof, and that these differences can be analyzed and determined by methodical, systematic procedures. Except for "whole-job" ranking, the concept of factors, or job characteristics, is fundamental. The principle here is that jobs can be identified with, and measured by, certain factors such as Mental Effort, Education, etc., by a process of comparing the job description with the description of the various factors, or by comparing the jobs with each other. In the point and factor comparison systems, the concept of quantification of job characteristics is fundamental. This concept assumes that the weights assigned to the separate characteristics actually represent their true contribution to the total value of the job.

One of the principles usually associated with job evaluation is that job content can be analyzed apart from the person or persons who perform the job. This is briefly characterized as "evaluating the job and not the man." The purpose of this approach is to achieve as high a degree of objectivity as possible and thus, as an end result of the procedure, produce a wage structure that is "equitable," and aligns the jobs so that those with equal difficulty, responsibility, etc., will receive equal rates.

Because of its close relationship to such procedures as employment, merit rating, placement and other personnel practices, job evaluation has received considerable attention
from the industrial psychologists. Viteles (53, 52, 73) and Lawshe (63-69) have made important contributions to job evaluation by their analyses of some of the basic concepts and practices. Lawshe, for example, has performed investigations to determine what factors in certain point plans, were actually contributing to the measurement of the jobs, and to what extent. He used advanced statistical techniques and scientific research procedures.

The economic aspects of job evaluation are important, although the relationship between the two areas is indirect. Theoretically, the internal alignment of job rates is not dependent upon factors outside of job content. However, the relative position of the top and bottom jobs in the structure can be seen to be affected by economic pressures such as supply and demand, the general position of the economic cycle, company-union negotiations, cost of living, and government regulations. The community wage survey has become an inherent part of the final setting of rates in the job structure. This survey procedure often utilizes parts of the evaluation program such as job descriptions, key job selection, and even in some cases, the point values, as an aid in securing more accurate data. The survey results and the evaluation results are usually plotted against each other to form a "wage line" chart. From this chart most of the finalization of the wage structure, including job classes, rate ranges, exceptional
(or "red circle") jobs, and the over-all picture of job relationships is obtained. While this is a procedural problem, careful gathering of data, statistical treatment of the data and thorough analysis is necessary to insure accuracy of the final results of job evaluation.

Wage incentives has long been a method of payment for work. Taylor attempted to systematize the establishment of incentive rates, but did nothing about the base rate problem, which is the province of job evaluation. The fact that incentive pay is designed to reward the worker for production above standard, for which standard he receives the base rate established by job evaluation, emphasizes the interrelation between these two concepts. It also creates problems. One of the most troublesome problems is that often the lower paid production jobs are on an incentive basis, while the higher skill jobs are not. Thus, by exceeding standard by 30%, for example, the production worker in many cases can earn as much "take-home pay" as the highly skilled worker. This whole problem has been intensified by the gradually narrowing range between skilled and unskilled workers.

The phenomenon of technological change is an all-pervading one, and has had its effect on most of society today. Job evaluation might be thought of as a result of technological change in that its development grew out of the changes in the nature of industrial jobs, and likewise in business and
government. The increasing application of the idea of division of labor in the so-called mass production industries, destroyed the old apprentice-journeyman-master arrangement, and substituted jobs that could be easily learned in a short while and required only a few skills. Job evaluation attempted to provide a means by which such jobs could be rated and pay scales established.

The fact that technological changes continue means that the duties, responsibilities and other phases of job content will continue to change. As new industries are created, with totally new occupations, and modifications of old ones, the requirement for an objective, accurate determination of relative job worth is an extremely important one.

Job content changes can result in both the "dilution" and also increasing the difficulties of jobs. These problems, and others connected with technological changes, are of immediate and pressing concern of labor unions. Many company-union agreements contain clauses pertaining to changes in job content, their evaluation and policies regarding rate changes resulting therefrom. This close connection between technological changes and job evaluation has led many workers to feel that somehow job evaluation is the cause of rate reductions. However, inasmuch as job evaluation is just a "by-product" of the technological changes, this is obviously erroneous thinking. It does present a problem in certain cases with the administration of a job evaluation program.
Although the methods of job evaluation have been largely developed by empirical methods, some of the influences of the scientific method, especially in regard to methods of the social, or human, sciences, are noticeable. For example, the steps in evaluating jobs under most systems, follow, to a certain extent, the steps in the scientific method. This does not necessarily qualify the results as scientific, however.

The sciences of psychology and sociology are most closely associated with the concept of job evaluation. The psychologists, particularly, have contributed either directly or indirectly to job evaluation. Such phases of the study of human beings at work as job analysis, merit rating, testing and selection, training, safety, and related subjects, have much in common with the problems of job evaluation. The studies of rating techniques, scale construction, detection and correction of biases, group action, and questionnaire construction and administration are a few of the areas where both psychologists and sociologists have developed proven methods that can be of direct value to job evaluation theory and practice.

Two pieces of research in job evaluation of outstanding scope and importance are (1) the Lawshe studies at Purdue University, (63-69) and (2) the 'steel companies' Cooperative Wage Study (73). Lawshe and his associates conducted a series of experiments using such statistical methods as
factor analysis and the Wherry-Doolittle shrinkage selection method to discover the essential, underlying factors that were actually measuring job content in point plans and factor comparison plans. The general result was that two or three factors (Skill Demands, Job Characteristics, Attention Demands) were identified as basic. This means that several of the usual factors were measuring the same thing, and were not contributing to the total score as intended in the design of the plan. Lawshe also demonstrated that a plan using three factors out of the normal eleven of twelve, selected by the Wherry-Doolittle method, was as reliable, or more so, as when the full number was used.

The steel company research was of the applied type, in that a new job evaluation plan was the goal of the study. However, the procedure was carefully carried out on scientific research lines, and a complete statistical analysis was made by the most advanced methods. The basic assumption for this study is significant. The then current wage structure for the steel industry was to be the criterion, and the factors and degrees were to be so weighted that the resulting evaluations would conform to the structure and at the same time correct inequities in individual rates.

Both of the above research projects are important also from the standpoint that they indicate the way more clearly for future research in the field of job evaluation.
Conclusions. From a survey of the history of wage differentials, it is evident that the techniques and concepts of job evaluation are products of the times and are indigenous to those countries with the free enterprise philosophy of industry. It is also evident from an analysis of attitudes regarding work and wages from the early beginnings of economic activity, that some of these attitudes persist today. The general aversion to working with one's hands, and the approbation of pursuits requiring mental application and training of the mind, is not a twentieth century phenomenon, but can be traced to the dawn of history. An important phase of economic life until recently, was that of slavery, in that slaves performed much of the manual work of the world. This arrangement was accepted by all peoples, and strongly influenced economic and moral thought. Although slavery has vanished from the American scene (less than 100 years ago), the attitude of many employers for a long time was that employees, especially those performing manual work, or apprentices, were in a sense, "owned" by them. Certainly the fact that slaves were generally maintained at a subsistence level influenced the trend of minimum wages (for those who did the unskilled, manual labor) for hundreds of years.

Wage differentials have always existed, and have been based to a large extent on such factors as the status of the craft, or the class (i.e., slave, freeman, apprentice, journeyman, master, professional man, etc.), economic forces, and,
of course, the bargaining power of the parties involved, based in part on the above factors, and in part on the immediate situation. Undoubtedly, status was achieved by (or accorded to) those crafts or professions, partially at least, on the basis of the skill required, or the difficulty involved, or the risk inherent, in the performance of the work. As the status of a particular craft became established, it solidified into tradition. The relative earnings and wages also became traditional, and formed a very real concept in the minds of workers, particularly in the unions. The Industrial Revolution had an important effect on this status system, reaching a high point with the advent of extensive mass production activities. The conflict between capital and labor can in part be attributed to the opposing forces of traditions and technological change. The employers were also following traditions, perhaps older than those of craft status. Job evaluation is a concomitant concept with technological change, and most of the plans attempt an objective, systematic, logical solution to wage differentials based on job content only. While it can be argued that status is based on job content, the according of status was an entirely subjective process, evolved over long periods, and in many cases the job content changed, but the status remained. Nevertheless, the traditional aspects of wages and jobs are a very real concept in people's minds. Thus it is found that conflict will arise in the application of job evaluation.
programs, because although the results may be logical, they differ with tradition. (There are other reasons for difficulties with the installation of job evaluation programs, some of which are technical, some of which are administrative. Failure to include the employees, or their union, in the program is such a reason, underlying which may be the fear or belief on the part of the employees that "traditional" rates and differentials will be ignored.)

A fundamental question arises regarding the relationship between tradition and the logical, job content approach of most evaluation plans. Tradition, of course, is difficult to identify and quantify. Does the current wage structure fairly represent this idea, and how important is it that such be considered, might be a justified question in this case.

The steel companies' research referred to in the chapter on the Scientific Method and Research was based on the assumption that the wage structure then generally used was a valid criterion for the evaluation of jobs, because it represented negotiations and wage developments that might be termed traditional. The factor comparison type of job evaluation plan also utilizes current rates of "key" jobs as the basis for establishing the rating scale. These key jobs normally are those which are stabilized, well known, and the rates for which are already acceptable. This is the type of condition conducive to formulating subjective status concepts about
jobs; this concept is transferred into the evaluation process by means of the key jobs.

The subjective, traditional, status type of conception that exists in the mind also has another, but related role in the process of determining relative wage rates. The theory is that in a job evaluation rating process, the raters enter into the process with an open, but not vacant, mind. That they have biases is acknowledged, but if the results are to be objective, no preconceived ideas as to the final rate structure is allowed. However, if one examines the findings and data of the investigations of Lawshe and other researchers, it is evident that the raters did have preconceived ideas regarding the final ratings, and evaluated jobs on the various characteristics (factors) in such a manner that the jobs which they subjectively place high on the total scale, received that kind of point value. The fact that in one study, Lawshe found that "skill demands" accounted for 99% of the total variance, is as much an indication of general tendency toward assigning points for individual factors in accordance the preconceived relationship of jobs, as an indication that "skill" was the only determinant of job worth in the minds of raters.

Additional research is needed to verify the hypothesis that job raters under the point type plans assign individual factor values in accordance with their preconceived ideas or
impressions as to the relative positions of the jobs. If this hypothesis is not proved false, it would mean that such job evaluation plans (or their application, to be more exact) are not in the true sense objective, but more correctly, are devices for systematically reaching preconceived conclusions. The theory behind the steel companies' plan and the factor comparison plan lend credence to this hypothesis.

It has been noted that approximately 75% of all job evaluation installations are of the point rating type. It might be reasoned that if these installations are "successful," one factor in that success would be that the traditional structure had not had time to crystalize and thus prevent conditions for preconceived ideas. This latter is somewhat of a remote possibility, because of the carry-over or transfer of such concepts from one industry to another, and so on.

The various administrative and operational problems connected with job evaluation have not been touched on to any extent. Unquestionably such phases have an important bearing on the success or failure (synonymous with continuance or discarding) of any given program. As a matter of fact, a poorly conceived plan can, by aggressive and thorough management, be made to "work," whereas a carefully constructed plan may fail to live up to expectations as the result of poor administration. The acceptability of a given plan to a union (one type of subjective criterion on which job evaluation plans may be judged) may not be determined by the excellence of the plan.
itself, but by the sincerity, general ability of management, and the status of the relationships between union and management. Although it is not feasible to determine the magnitude of errors or the effect of such factors (administrative, etc.) in the final wage structure, it would appear that some of the technical errors or defects in the details of the plan itself, are not the most important elements.

From another viewpoint, if the employees and the union are convinced that the job evaluation program is a sincere attempt on the part of management to correct wage rate inequities, and management welcomes participation by employees, such a program can be the vehicle for increased understanding and better relations between union, employees and management. It thus behooves management to be fully informed and aware of the assumptions, problems and type of results that may be expected from the different types of job evaluation plans. It is with these latter type of considerations that this thesis has dealt.

The role of habits of thought and tradition was emphasized above, yet if wage inequity problems could have been solved by these subjective concepts, the analytical approach of job evaluation would never have been found necessary. It was just exactly the breakdown of these methods in industries where job content was rapidly changing because of technological advances, and wage rates had to be determined before tradition, status and other subjective measures were fixed to any
degree in people's minds. That systematic, logical methods can yield results which do not conflict with traditional concepts is an indication that the fundamental theories and approaches of job evaluation are sound. It also indicates that the general thinking regarding objectivity, omission of consideration of current rates, traditional structures, and negotiation of wages on the basis of the evaluation process, needs re-orienting. Again it is necessary to point to the steel companies' research and development of a plan based on the assumption of the validity of the general wage structure in the industry.

If any broad conclusion can be drawn regarding job evaluation it is, that a proper blending of the objective techniques (which obviously need refining) and the subjective concepts related to wage differentials (which are the products of centuries of habit of thought, and tradition, and certain economic forces) is necessary for continued advancement in this field.
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APPENDICES
Almost all Master Manufacturers now find it in their interest to pay their work-people by the Piece, or the Great, wherever they can, rather than by the Day: Which Circumstance alone is a striking Proof, that no sufficient Check hath yet been invented against the loitering away of Time, when the Master was to pay for it: Not to mention that the Person who works by the Day hath scarce any motives to exert an Industry, Dexterity, or Skill superior to others; whereas the working by the Piece or the Great, calls them all forth; because he himself, and none others, are to reap the Benefit and Reputation of them. [And N.B.: this single Remark, were there no others, is sufficient to prove that Slaves, who very literally work by the Day, and can have no Motive whatever to exert any other Industry, Dexterity, or Skill, than what is just sufficient to escape the Whip of the Driver; may whose Self-Interest will naturally teach them to conceal any superior Talents from the Knowledge of their Masters lest their Masters should expect a greater Task from them than others, and punish them for not doing it; -- I say this single Remark is a full Proof, that Slaves never did, nor ever will perform their work either so cheap, or so well, as those Freemen who work by the Piece or the Great, and are spurred on every Moment by the Examples of others, by Self-Interest, and by the Glory of excelling.] As to Checks against bad work, the Judgment of the Master or Overseer is the best, and perhaps the only Remedy that can be applied in such a Case. But in respect to embezzling of Materials, and various are the Methods contrived, and almost every Manufacture hath a different one; sometimes the Goods are weighed in and out, due Allowance being made for necessary Waste: At other Times Check-Engines are used to ascertain the Length or Measure, and in general Sleaing, or Weaving-Tables, are a tolerable Security against Impositions in the Weavings of Woolens, Stuffa, Linens, Silks, Cottons, &c.

Few Countries are equal, perhaps none excel the English in the Numbers and Contrivance of their Machines to abridge Labour. Indeed the Dutch are superior to them in the Use and

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Application of Wind-Mills for sawing Timber, expressing Oil, making Paper, and the like. But in regard to Mines and Metals of all Sorts, the English are uncommonly dexterous in their Contrivance of the mechanic Powers; some being calculated for landing the Ores out of Pits, such as Cranes and Horse-Engines: Others again for draining off superfluous Waters, such as Water Wheels and Steam Engines: Others again for easing the Expence of Carriage, such as Machines to run on inclined Planes, or Roads down Hill with wooden Frames, in order to carry many Tones of Materials at a Time. And to these must be added the various Sorts of Levers used in different Processes: Also the Brass Battery Works, the Slitting Mills, Plate, and Flattning Mills, and those for making Wire of different Finess. Yet all these, curious as they may seem, are little more than Preparations or Introductions for further Operations. Therefore when we still consider, that at Birmingham, Wolverhampton, Sheffield, and other Manufacturing Places, almost every Master Manufacturer hath a new Invention of his own, and is daily improving on those of others, we may aver with some Confidence, that those Parts of England in which these Things are to be seen, exhibit a Specimen of practical Mechanics scarce to be paralleled in any Part of the World. ... As to Machines in the Woollen, and Stuff Way, nothing very considerable hath been of late attempted; owing to a great Measure to the mistaken Notions of the infatuated Populous, who not being able to see farther than the first Link of the Chain, consider all such Inventions, as taking the Bread out of their Mouths; and therefore never fail to break out into Riots, and Insurrections, whenever such Things are proposed. In regard to the Silk Manufacture, the Throwsting Mills, especially the grand one at Derby are eminent Proofs of the Abridgment of that Species of Labour: And some Attempts have been lately made towards helping forward the Cotton and Linen Manufactures by means of certain Engines.

In regard to the other Part of the Quiry, viz. What is the Consequence of this Abridgment of Labour, both regarding the Price of the Goods, and the Number of Persons employed? The Answer is very short and full, viz. That the Price of Goods is thereby prodigiously lowered from what otherwise it must have been; and that a much greater Number of Hands are employed. The first of these is a Position universally assented to; but the other, though nothing more than a Corollary of the former, is looked upon by the Majority of Mankind, and even by some Persons of great Name and Character, as a monstrous Paradox. We must therefore endeavour to clear away these Prejudices Step by Step. And the first Step is, that Cheapness caeteris paribus is an Inducement to buy, —
and that many Buyers cause a great Demand, -- and that a
great Demand brings on a great Consumption; -- which great
Consumption must necessarily employ a vast Variety of Hands,
whether the original Material is considered, or the Number
and Repair of Machines, or the Materials out of which these
Machines are made, or the Persons necessarily employed in
tending upon and conducting them: Not to mention those
Branches of the Manufacture, Package, Poterage, Stationary
Articles, and Book-keeping, &c. &c. which must inevitably be
performed by human Labour. But to come to some determinate
and striking Instance, let us take the Plow, the Harrow, the
Cart, the Instruments for Threshing and Winnowing, and the
Mills for Grinding and Boulting, as so many Machines for
abridging Labour in the Process of making Bread: I ask, do
these Machines prevent, or create Employment for the People?
and would there have been as many Persons occupied in rais­
ing of Corn, and making of Bread, if no such Engines had*
been discovered? -- The obvious Reply to this inquiry is, That
probably the wheaten Loaf had been confined to one, or two
Families in a State, who, on Account of this superior rank,
and vast Revenues, could have afforded to give an extravagant
Price for their delicious Morsel: But it is impossible that
under such Circumstances, it ever could have become the com­
mon Food of the Kingdom: This same Remark would hold good,
were it to be applied to the Art of Printing, and to the
Numbers of People, from first to last, therein employed: For
Printing is nothing more than a Machine to abridge the
Labour, and reduce the Price of Writing. -- But Examples are
endless; and surely enough has been said, to convince any
reasonable Man, though even the great Author of L’Esprit
des Loix should once be of a different Mind that that System
of Machines, which so greatly reduces the Price of Labour,
as to enable the Generality of a People to become Purchasers
of the Goods, will in the end, though not immediately,
employ more Hands in the Manufacture, than could possibly
have found Employment, had no such Machines been invented.
And every manufacturing Place when duly considered, is an
Evidence in this Point....

4. Is that Labour, which is still to be performed by
the human Kind; so judiciously divided, that Men, Women, and
Children have their respective Shares in Proportion to their
Strength, Sex, and Abilities? And is every Branch so con­
trived, that there is no Waste of Time, or unnecessary
Expence of Strength or Labour? Moreover, what good conse­
quences attend these Circumstances in such Parts of the King­
dom, where they are observed, and what bad ones in other
Parts where they are not?

A. In many Provinces of the Kingdom... the labour,
for the most part, is very properly proportioned, and great
Judgment appears in the Methods and Contrivances for bring-
ing the several Parts of the Manufacture so within the Reach
of each other, that no Time should be wasted in passing the
goods to be manufactured from Hand to Hand and that no un-
necessary Strength should be employed. For an Instance of
both Kinds, take one among a Thousand at Birmingham, viz.
When a Man stamps a metal Button by means of an Engine, a
Child stands by him to place the Button in readiness to re-
ceive the Stamp, and to remove it when received, and then to
place another. By these means the Operator can stamp at
least double the Number, which he could otherwise have done,
had he been obliged to have stopped each Time to have shifted
the Button: And as his Gettings may be from 14d. to 18d., and
the Child's from a penny to 2d. per Day for doing the same
Quantity of Work, which must have required double the Sum;
the Man alone employed; this single Circumstance
saves about 80 or near 100 per Cent at the same Time that it
trains up Children to an Habit of Industry, almost as soon
as they can speak. And hence it is, that the
Birmingham Toys are rendered so exceedingly cheap as to as-
tonish all Europe; and that the Roman Catholic Countries are
supplied with such vast Quantities of Crucifixes, Agnus
Dei's, &c. from England. Dozen of these Crucifixes, as I am
informed, being to be sold, in the wholesale Way, for
7 1/2d. — But the good Effects of this proportioning of
Labour to different Strengths and Sexes, is still more exten-
sive than it at first appears. For in Birmingham the Numbers
of poor Women on the Pay-Bill, compared to those of poor Men,
are hardly as three to two; whereas in Bristol, where no such
good Polities obtain, the Numbers are upwards of four to one;
and in many Parts of London, it is still much worse: So
great is the Difference, and such the Expensiveness and heavy
Burdens of a wrong Conduct even in this Respect: not to men-
tion, that Prostitution and Debauchery seem to be an unavoid-
able Consequence in the female Sex of Poverty and Idleness,
when they are young; and when they grow old, what Refuge can
they have, if they do not soon rot with their Diseases, but
the Parish Pay?

Q. In those Towns and Places, where great Manufactures
are carried on, are there many independent Masters, and a few
Journeymen to each Master? Or few independent Masters, and
many Journeymen? And what is the Difference, in regard to
Morals, Cheapness and Goodness of Work, Extent of Trade,
Rioting, and Robbing and the like?

A. This latter is better illustrated by comparing the
same Manufacture, and the Consequences attending it, under
the different Circumstances here referred to. In many Parts
of Yorkshire, the Woollen Manufacture is carried on by small
Farmers and Freeholders: These People buy some wool and grow some; their Wives, Daughters, and Servants spin it in the long Winter Nights, and at such Times when not employed in their Farms and Dairies; the Master of the Family either sells this Produce in the Yarn Market, or hath it wove up himself. It is then milled, cleansed, and brought to Market generally to the Town of Leeds; but when sold there, he can be paid for no greater Number of Yards than the Cloth will measure, after having been well soaked in Water: By which means all Frauds in Stretching, and Tent-ring, &c. are effectually prevented. The Persons who buy this Cloth generally act upon Commission at a very low Rate; and afterwards cause the Cloth to be dyed (if it was not dyed in the Wool) and to be properly dressed and finished. Thus, the whole passes through various Hands independently of each other. And though in Fact the Spinner, Weaver, Millman, Dyer, Presser, &c. are all of them the Journeymen of the Agent or Commissioner, who stands in the Stead of him who is the Clothier in other Places; yet by acting thus upon a distinct footing, they conceive themselves as far independent of him; and of each other, as any Buyer or Seller whatever; And, being thus independent, they are all Rivals, all animated with the same Desire of bringing their Goods to Market upon the cheapest Terms, and of excelling one another. Their Journeymen likewise, if they have any, being so little removed from the Degree and Condition of their Masters, and likely to set up for themselves by the Industry and Frugality of a few Years, have no Conception that they are embarked in an Interest opposite to that of their Masters, or that they are called upon to enter into Clubs and Combinations against them. Thus it is, that the working People are generally Moral, Sober and Industrious; that the Goods are well made, and exceedingly Cheap; and that a Riot or a Mob is a Thing hardly known among them. Whereas in Gloucestershire, Wiltsshire, and Somersetshire, the Manufacture is carried on by a quite different Process, and the Effects are accordingly; viz. One Person, with a great Stock and large Credit, buys the Wool, pays for the Spinning, Weaving, Milling, Dying, Shearing, Dressing, &c. &c. That is, he is Master of the whole manufacture from first to last, and perhaps employs a thousand Parsons under him. This is the Clothier, whom all the Rest are to look upon as their Paymaster. But will they not also sometimes look upon him as their Tyrant? And as great Numbers of them work together in the same Shop, will they not have it the more in their Power to vitiate and corrupt each other, to cabal and associate against their Masters, and to break out into Mobs and Riots upon every little Occasion? The Event hath fully showed, and is not showing, that these Conjectures are too frequently supported by Facts. Besides, as the Master is placed so high above the Condition of the
Journeyman, both their conditions approach much nearer to
that of a Planter and Slave in our American Colonies, than
might be expected in such a Country as England; and the
Vices and Tempers belonging to each Condition are of the
same kind, only in an inferior Degree. The Master, for
Example, however well-disposed in himself, is naturally
tempted by his situation to be proud and over-bearing, to
consider his People as the Scum of the Earth, whom he has a
Right to squeeze whenever he can; because they ought to be
kept low, and not to rise up in Competition with their superi-
ors. The Journeymen on the contrary, are equally tempted
by their Situation, to envy the high Station, and superior
fortunes of their Masters; and to envy them the more, in
Proportion as they find themselves deprived of the Hopes of
advancing themselves to the same Degree by any Stretch of
Industry, or superior Skill. Hence their Self-Love takes a
wrong Turn, destructive to themselves, and others. They
think it no Crime to get as much Wages, and to do as little
for it as they possibly can, to lie and cheat, and do any
other bad Thing; provided it is only against their Master,
whom they look upon as their common Enemy, with whom no Faith
is to be kept. The Motives to Industry, Frugality, and
Sobriety are all subverted by this one Consideration, viz.
That they shall always be chained to the same Oar, and never
be but Journeymen. Therefore their only Happiness is to get
Drunk, and to make Life pass away with as little Thought as
possible. This being the Case, is it to be wondered at, that
the Trade in Yorkshire should flourish, or the Trade in
Somersetshire, Wiltshire, and Gloucestershire be found de-
clining every Day? The real Surprize would be to discover,
that such Causes did not produce such Effects: And if were
the Manufactures in the North (Yorkshire) should adopt the
bad Policy of the West, (Somersetshire, Wiltshire, and
Gloucestershire) and vice versa, Things will come around
again.

The Statutes for regulating Wages and the Price of
Labour, are another absurdity, and a very great Hurt to Trade.
Absurd and preposterous it must surely appear, for a third
Person to attempt to fix the Price between Buyer and Seller,
without their own Consents: For if either the Journeyman will
not sell his Labour at the fixed or statutable Price, or the
master will not give it, of what Use are a thousand regulat-
ing Laws? Nay, how indeed can any stated Regulations be so
contrived, as to make due and reasonable Allowance for Plenty
or Scarcity of Work, Cheapness or Dearness of Provisions,
Difference of living in Town or Country, Firing, House-Rent,
&c. &c. also for the Goodness or Badness of the Workmanship,
the different Degrees of Skill or Dispatch of the Workman, the
unequal Goodness of Materials to work upon, State of the
Manufacture, and the Demand, or Stagnation at home or abroad? I say, how is it possible to make due allowance for all these various and contingent circumstances? And yet, were even this possible, a great difficulty still recurs, viz. Who shall, or how can you force the journeyman to work, or the master to give him work, unless they themselves shall mutually agree about it? — And if they agree, why should you, or I, or anyone else interfere? And what need of any regulations at all? In short, such laws as these can do no good, because they never can be carried into a regular, useful practice: But on the contrary, they may cause a great deal of mischief, riots, and disturbances; and will infallibly, sooner or later, drive the trade from that country, where men are absurd enough to attempt to put them in execution.
As was true with most companies, the managements of companies in the steel industry found through the past twenty years that wage-rate inequities were becoming a larger and larger problem. Much of the steel industry was unionized in 1937 and 1938, which fact accentuated the problem. Through the war years when general wage increases were largely stopped by presidential order, the issue of wage-rate inequities became a means of obtaining increases otherwise denied, and, for that reason, increased in its importance. It was more and more evident as time went by that the problem of wage-rate inequities was developing to a climax; and since the management of much of the industry agreed that the problem was a mutual one, in 1944 twelve of the larger steel companies agreed to pool their effort and talent toward a solution of the problem. An organization was established, a firm of industrial engineers was retained to act as coordinators, and each company furnished the engineer responsible for the administration of job evaluation. Mr. Conrad Cooper, then Assistant Vice President of the Wheeling Steel Company, was appointed director.

This task force was given a directive to develop the best means of wage determination and the solution of the ever-present wage-inequity problem. Great latitude was given to the group in this job. One specific detail modified this latitude -- the solution to be practical and to be of any final use must be simple so that it could be used by non-technical union representatives. Several months were spent in exploring those simple and direct avenues of wage determination; such as, grouping of jobs by titles, the ranking of jobs by over-all judgment of groups of supervisory personnel, and other similar means. The analyses of the results of

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these studies were reviewed by committees of company officials, and it was decided reluctantly that no simple, single step was the answer to the problem. It was, therefore, decided that analysis of jobs based upon the requirement of each job held the most promising possibilities for a successful method. The next several months were spent in research into job evaluation. All of the plans then in common use were studied, and three plans having wide differences were chosen for a series of tests. It was hoped that the good and bad features of evaluation plans in general could be disclosed by intelligent testing.

The three plans were, first, a very simple plan, that in use by the General Electric Company, which had only five factors and used only a few bench-mark jobs to aid in the evaluation of individual jobs. Second, a plan intermediate in complexity, used by the Wheeling Steel Company, was chosen; and the third was the highly detailed plan of the United States Steel Corporation. This plan contained fourteen factors; and, in addition, most of the factors were further subdivided so that more than thirty separate determinations were required in the evaluation of a job.

Experiments were laid out to test the various features of these plans. A group of jobs was selected in a plant of the American Rolling Mill Company, one of the participants, and each job was evaluated nine times—three times with each of the three plans by different engineers in conference with different supervisors familiar with the jobs. The tests included about one hundred separate evaluations. The results of this experiment, performed on this scale for the only time in so far as we knew, were studied at length to determine: first, which plan fitted the existing wage structure best; second, which plan gave the greatest degree of consistency in application by different analysts and different supervisors; third, which plan was the most economical to use, especially in terms of supervisory time; fourth, to which plan did the supervisors react best.

The results of (1), which plan fitted the wage structure best, were inconclusive. The distribution of weights among the various factors was the conventional pattern similar to that in use in the National Metal Trades and NEMA plans. None of them was satisfactory on this score if a better fit to the wages paid in the steel industry could be developed. Second, as to consistency, results were compared by factors. Surprisingly, the factor, mentality or mental skill, was evaluated most consistently in all plans. Those factors which had been subdivided for most consistent application showed no significantly greater consistency than the
simplest factors. This was a considerable disappointment to the "died-in-the-wool" technicians who had developed the complicated plans. The results of these tests definitely led to a reversal in the trend toward complexity for the sake of consistency.

The form in which the various factors were presented in the evaluation manuals seemed to have a significant effect upon their consistency of interpretation. The various forms of presentation were divided into three types for comparison. The first was called the "some-more-most" type because the degrees in the factors of, say, responsibility were described as some responsibility, more responsibility, and most responsibility. The second type depended upon bench-mark jobs to define the amount of the factor to be assigned to each job. The third type was based upon job elements or simple statement of specific job duties. Typical of these, to illustrate physical effort, are "sweep floor", "operate crane-type controls", "saw boards with hand saw", "swing sledge", and "climb and work from ladders". Statistical analysis confirmed that the highest degree of consistency in interpretation of the plan came from the third, or job-element type, of presentation. It was decided as a result of these tests of three typical evaluation plans that a plan was to be developed in which four major factors measuring job requirements would be used. These factors of job requirements would be:

1. Skills
2. Responsibilities
3. Effort Required
4. Working Conditions

These major factors might be further broken down into more definitive factors; such as, Mental Skills, Education, Manual Skill, or Responsibility for Materials, Responsibility for Equipment, and Responsibility for Safety of Other Employees.

It was also decided that a factor not existing in any of the current plans should be considered. This was called responsibility for operations and was conceived largely because of the immense size of some of the operations in the steel industry where the failure of a single individual could result in major delays to large pieces of equipment or large numbers of men, and be the cause of substantial monetary losses.

After about six months of work, the following decisions had been arrived at:
1. Job evaluation was the most promising means of rate determination.
2. A point plan appeared to be the simplest and most effective type of job evaluation.
3. Jobs could be placed as consistently in each factor if the factors were a simple, single-scale affair requiring ranking of the jobs only once for the factor and if each degree in the factor were described in terms of work elements fitting the particular factor and degree and supplemented by an ample number of well-known bench-mark jobs.
4. The relative factor weightings in no existing evaluation plan appeared to fit the needs of the steel industry, inasmuch as existing relationships of the rates of large groups of jobs would be distorted to such a degree that as many apparent inequities would be created by such a plan as would be eliminated. This condition was caused by the fact that many of the highly responsible operating jobs, those responsible for the operation of major pieces of equipment, were paid substantially higher rates than the highly skilled group of tradesmen such as, carpenters, blacksmiths, and machinists. The weighting of the factors in currently popular evaluation plans placed these jobs about equal to or slightly below the trades group. From previous negotiation with union groups, it had become apparent that the disturbing of these major rate relationships in the industry would not be tolerated by labor. Some redistribution of relative factor weights was, therefore, in order; and it was suggested at this time that a systematic attempt be made to determine the best weights to fit the existing pattern of rates in the steel industry.

The following twelve factors were selected as possibly having appreciable weight:

(Four factors in the skill group)
1. Pre-employment Training (education)
2. Employment Training and Experience
3. Mental Skill
4. Manual Skill

(Four factors in the responsibility group)
5. Responsibility for Materials
6. Responsibility for Equipment
7. Responsibility for Operations
8. Responsibility for Safety of Others

(Two factors in the effort group)

9. Mental Effort (concentration required, not skill)
10. Physical Effort (at the performance of a fair day's work)

(Two factors in the working conditions group)
11. Surroundings
12. Hazards

Definitions for each of these twelve factors were worked out by the group. Preparation of these definitions is one of these cases where the writing of a definition of several hundred words is a fairly easy affair, but to conform to the over-all objective of having a plan which would be simple, easily understood and acceptable to the average labor leader, it was felt necessary to reduce these definitions to a few lines. This is a much more difficult task than the writing of long definitions.

There was some discussion of using whole labor grades as points in the evaluation plan, but it was decided that only thirty active points would not allow the necessary flexibility, and therefore, decided to evaluate using labor grades and tenths of labor grades. It had been agreed that under this plan jobs of equal job content should fall into the same labor grade anywhere in the country, although the local rate assigned to that labor grade might be different.

The next step in the process was the selection of a representative sample of jobs upon which to base the factor weighting of the plan. All of the participants submitted a list of jobs which they believed to be representative of the full range of skills, responsibilities, and other requirements. These lists were compared, discussed, and a final single list of 143 job titles was selected. Each participating company was asked to submit descriptions of these 143 jobs as they existed in each plant of the company. Since the twelve companies operated some seventy plants and some of the jobs occurred in almost every plant a total of about 240 separate job descriptions was submitted to form the basis of the plan.

The next step is the ranking of jobs in each factor. A preliminary evaluation plan was roughed out by methods somewhat similar to those which have been used in the final development of most plans in use up to that time. Each factor was broken into a number of degrees. These degrees were de-
refined, and each company was asked to evaluate its portion of the 2400 jobs on this preliminary plan. These 2400 preliminary evaluations were assembled, and the assigned engineers from each company tackled the job of correlating them or smoothing out the unjustifiable differences due to the local interpretations of the rough plan and differences in individual judgment. The idea behind this correlation was that if there was a justifiable difference between jobs known by the same title then the evaluations should justifiably be different. But if the jobs were essentially the same, the evaluation should be made the same. About thirty days were spent by the group in making this correlation, at the end of which time it was felt that most of the unjustified differences in the evaluations had been eliminated.

It was agreed that the actual factor weights to be derived would represent the rates in current use in the steel industry. With so large a sample of jobs from so many plants and scattered geographically across the northern half of the United States, it was assumed that the accidental differences in rates for jobs of equal requirements would have a normal distribution and that this sample could be depended upon to reflect the general wage structure of the steel industry for that region. Wage data were, therefore, gathered for each of the sample jobs.

The next problem lay in the use of the wage data collected. The problem was simple in the case of those jobs paid at straight hourly rates, since it is common practice in the steel industry to pay job rates with no rate ranges. However, in this industry about half of the employees are compensated through various plans of wage incentives, and in some of these cases the only recognizable factor in the wage-rate picture was the total earnings, there being so-called "occupational" rate. In many cases only the minimum rate of the industry was paid for jobs where the earnings might exceed such minimum rate by as much as 100 per cent. A relationship between the earnings from the incentive jobs and comparable hourly rated jobs was found. This relationship was used as a means of determining an apparent occupational rate for those jobs which had none.

Next the occupational rates of all of the benchmark jobs were converted into a series of labor grades. This is purely an empirical conversion; that is a series of labor grades was selected representing wage steps thought to be agreeable to the management and labor elements in the industry.

All of the elements were now at hand for the solution for the best factor weights. Each job had been assigned to
a labor grade according to its hourly wage rate. Also, each job had received a relative placement in each of the twelve factors. We now have the elements of an equation in which the value of a job in terms of labor grades is equal to the value of that job in degrees in each of the twelve factors multiplied by the respective weight of each of the factors. The fact is we have 2400 equations, one for each of the benchmark jobs. The equations, one for each job, may be written:

\[
\text{Value of Job in Labor Grades} = \text{Degree of Factor (1)} \times \text{Weight of Factor (1)} + \text{Degree of Factor (2)} \times \text{Weight of Factor (2)} + \ldots \ldots \ldots \ldots \ldots \ldots \]

Without the help of an advanced, yet practical, statistician, the solution would not have been possible. None of the engineers assigned to the project understood the advanced statistical methods necessary. They, however, took the attitude that if improved factor weights could be worked out, the improvement would be obvious in the final results and it would be necessary to justify to the responsible people the details of the methods used.

It is possible to solve for twelve unknowns when 2400 samples or observations are available in which the twelve unknowns exist by the use of regular statistical techniques, such as multiple linear correlation. To those of us who never got beyond the usual engineering mathematics, multiple correlation is best described as a combination of the method of least squares with the method of solution of simultaneous equations. By squaring and cross-multiplying each of the terms of the 2400 equations by each of the other terms in the respective equation and by a summation of all terms, it is possible to reduce the original 2400 equations to twelve equations and, by the solution of these twelve equations, to determine average linear factor weights. It was known that this solution would still be short of the final desired answer in two respects. First, the average linear factor weight would give only the average distribution of the factor weight and not the best distribution within each factor. That is, this solution would assume a straight-line distribution of the points or labor grades within each factor, although there was good reason to believe that this would not be the best distribution. Secondly, it was also known from previous attempts at this solution that the various factors chosen are not necessarily independent of each other, and this interdependence prevented such a simple solution for the factor weights. In other words, if in the minds of the
people making the classifications the factor of experience was actually measuring the same qualities as the factor mental skill, then the mathematical solution could not distinguish between the two factors nor determine how the weight should be distributed between the two. It might actually throw all the weight to one factor leaving the other one with no weight or even a negative weight. A negative value for such an important factor as experience would be obviously a spurious answer and totally unacceptable to everyone concerned. In the actual solution, three of the factors showed negative after the solution of the normal equations, and further analysis was necessary in order to correct such impractical results.

The mass of the mathematical work was done through the use of International Business Machines' tabulating equipment. A tabulating card was punched for each job, showing the job number for identification, the labor grade to which the job had been assigned because of its hourly rate, and the preliminary assumed factor weight assigned to the job in each factor. To establish the twelve normal equations, it was necessary to multiply each of the thirteen values in each card by itself and each of the other twelve values. Each of these multiplications was done twice, so that there were thirteen times thirteen or 169 multiplications on each of the 2400 cards, or 405,600 values into the normal equations. After the cards were punched, this mass of calculations was done in about ten hours on the tabulating machines. The solution of the twelve equations, the development of the pattern of intercorrelation coefficients, and the other figures representing statistical controls required about eight hours of a good mathematician's time.

Because of the very close relationship between some of the factors, notably pre-employment training (representing education), experience, and mental skill, the coefficients of intercorrelation are very high, that between mental skill and experience being .92. For all practical purposes this high coefficient means that the two factors are measuring the same quality and that the two factors could be combined without doing harm to the evaluation plan. While this combination was considered, it was decided that because of the material weight each of the factors appeared to required, to combine them would make a factor having such a great weight that individual errors of judgment in the placement of jobs in that factor would be reflected in large errors in the total. It was, therefore, considered better to leave the total weight as two factors with the expectation that such errors in judgment would compensate for each other at least part of the time. The very high intercorrelation existing,
however, between factors apparently had resulted in some of the factors being thrown badly out of line with what judgment and experience indicated would be a proper weight. This effect had been anticipated, and the next step was the resolving of the effect of this intercorrelation.

An advanced statistical technique was employed in the elimination of intercorrelation of the factors. It is known as the method of orthogonal coordinates in linear regression. It operates upon the matrix of coefficients of intercorrelation by a process known as iteration, and its use is beyond the scope of any but the advanced statistician. The method involved a large amount of calculation, and almost thirty days of continuous work were necessary to arrive at the best linear factor weights.

The next step was the solution for the curvilinearity of the weights within the factors. The method used, the determination of curvilinear correlation by successive approximations, is set forth in most modern statistical texts, among which may be mentioned Mordecai Ezekiel's *METHODS OF CORRELATION ANALYSIS*.

The curvilinearity of the relationship between the factor degrees and the labor grades assigned is worked out by evaluating all of the jobs by use of the linear factor weights and then plotting the average residuals above or below the line representing the linear weight. (The residuals are the amounts by which the sum of the factors as evaluated fail to equal the originally assigned factor weight.) This process was performed for each factor successively, and the total residual or error inherent in the linear approximations was substantially reduced. This error was further reduced by replotting each factor with the residuals remaining in order to further correct the fit.

Analysis serves to illustrate the fallacy of comparing evaluation plans by means of the maximum weight in each factor. A tabulation of maximum weights and weights for the average jobs discloses very different distributions. In this factor only one or two per cent of the jobs and people are at the maximum.

<table>
<thead>
<tr>
<th></th>
<th>5th Degree</th>
<th>Typical Job</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Conventional Plan</td>
<td>2.0</td>
<td>5</td>
</tr>
<tr>
<td>2. Average linear weight</td>
<td>1.6</td>
<td>4</td>
</tr>
<tr>
<td>3. Final curvilinear weight</td>
<td>3.0</td>
<td>3</td>
</tr>
</tbody>
</table>

From this tabulation it is seen that while the weight of
the factor is apparently increased when the maximum weight is used as the measure, this increase applies only to those jobs in the top degree, where it is needed to compensate the people working under extreme conditions of disagreeableness. The weight of the factor for the jobs worked in ordinary surroundings is actually reduced. This makes the difference between the weight assigned to the average job and the extreme job greater yet, and this difference is the important thing since all values in job evaluation are relative.

In the final analysis, it was found that the factor responsibility for safety of others had no actual weight in rates in the steel industry at the time. After consultation, it was decided to give this factor a positive, although small, weight, because it was believed desirable to stress the idea of responsibility for safety of others as a part of good management. A maximum weight of two classes, therefore, was assigned. However, the weight received by the majority of jobs is negligible. This adjustment was entirely empirical and is an example of the action of group judgment based upon the actual facts as developed.

Having derived the factor weights, all parts of the final plan of evaluation are now assembled. A manual of evaluation was prepared with general instructions and definitions, showing each of the twelve factors with the factor definition and instructions, the descriptions of the various degrees, the bench-mark jobs which had been selected, and the number of job classes for each degree. By the use of this manual, it has been found that the field evaluations, that is the preliminary evaluation made by the analyst in the plant in collaboration with the responsible supervisor, are reasonably consistent and required a minimum of correlation with other jobs.

An outline of the benefits of this plan relative to other conventional plans may be summarized as follows:

1. **Acceptability.** The plan has had generally good acceptance from supervisory personnel who have been called upon to use it. Its use has been negotiated with the United Steelworkers' Union and is currently in effect in a very large segment of the steel industry, covering perhaps the jobs of 500,000 employees.

2. **Consistency of Results.** The plan has inherently the same degree of consistency as the best prepared plans in the past. It should be noted that no
method of assuring consistency in initial evaluations has been uncovered. Consistency with any plan can be assured only to the degree that cross comparisons and secondary checks are used. Unquestionably some of the evaluations made by independent companies which have not been subject to such a correlation deviate from the best pattern. However, to date such deviations have not appeared serious.

3. Conformance with a Wage Structure. This ia a point on which the advantages of this plan over others are measurable. A comparison was made to determine how well the existing wage structure is reflected as between this plan and the old United States Steel Corporation evaluation plan on a sample involving approximately one thousand jobs. The inequities indicated by this plan are about 15 per cent less than those indicated by the United States Steel Corporation plan. The placing of jobs having very high responsibilities conforms to the traditional recognition of the value of such responsibilities in the wage structure of the industry. On the other hand, the relative placing of these jobs by use of the conventional plans (here designated as a "light industry" plan) distorts the accepted relationships and compromises the possibility of success.

4. The Scope of the Plan. Being built upon the actual qualities and requirements of a broad sample of the jobs to be covered, the plan does adequately cover the selected field. However, as jobs which have large degrees of clerical work are evaluated, it is found that the application of the plan is much less definite and does not appear to be as satisfactory as when applied to the field for which it was designed.

5. The Sensitivity of the Plan to Measuring the Differences between Jobs. The fineness of breakdown of the measuring stick has been made to fit the size of the rate steps selected.
## APPENDIX D

### TABLE XV

List of Wages for Journeymen Cordwainers,
New York City, March 1, 1805.

<table>
<thead>
<tr>
<th>Item</th>
<th>Dols.</th>
<th>Cts.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back Strap Boats, fair tops</td>
<td>4</td>
<td>00</td>
</tr>
<tr>
<td>Back Strapping the top of do.</td>
<td>0</td>
<td>75</td>
</tr>
<tr>
<td>Ornament Straps closed outside on do.</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>Back Strap Bootees</td>
<td>3</td>
<td>50</td>
</tr>
<tr>
<td>Wax Legs closed outside, plain counters, fair tops</td>
<td>3</td>
<td>25</td>
</tr>
<tr>
<td>Cordovan Boots, fair tops</td>
<td>3</td>
<td>00</td>
</tr>
<tr>
<td>Cordovan Bootees</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>Suwarrow Boots, closed outside</td>
<td>3</td>
<td>00</td>
</tr>
<tr>
<td>Do. inside closed, bespoke</td>
<td>2</td>
<td>75</td>
</tr>
<tr>
<td>Do. do. inferior work, do.</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>Binding Boots</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>Stabbing do.</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>Footing Old Boots</td>
<td>2</td>
<td>00</td>
</tr>
<tr>
<td>Foxing New Boots</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>Foxing and Countering Old Boots</td>
<td>2</td>
<td>00</td>
</tr>
<tr>
<td>Do. without Counters</td>
<td>1</td>
<td>75</td>
</tr>
<tr>
<td>Shoes, best work</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Do. inferior work</td>
<td>1</td>
<td>00</td>
</tr>
<tr>
<td>Pumps, French edges</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Do. Shouldered do.</td>
<td>1</td>
<td>00</td>
</tr>
<tr>
<td>Golo Shoes</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>Stitching Rans</td>
<td>0</td>
<td>75</td>
</tr>
<tr>
<td>Cork Soles</td>
<td>0</td>
<td>50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Process Class of Work</th>
<th>Type and Make of Machine</th>
<th>Base Rate 1905</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Spindle Mach.</td>
<td>1. Drills Single gang, multiple, radial</td>
<td>.20</td>
</tr>
<tr>
<td></td>
<td>2. Tapping machine</td>
<td></td>
</tr>
<tr>
<td>B Lathe</td>
<td>1. Engine Lathe Bore, turn, face, thread cutting</td>
<td>.25</td>
</tr>
<tr>
<td></td>
<td>2. Lo-Swing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Turret Fox or Gisholt</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Jones and Lamson</td>
<td>.25</td>
</tr>
<tr>
<td>C Milling Mach.</td>
<td>1. Power</td>
<td>.25</td>
</tr>
<tr>
<td></td>
<td>2. Hand</td>
<td>.20</td>
</tr>
<tr>
<td>D Automatatics</td>
<td>a. BAR WORK</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Cleveland</td>
<td>.25</td>
</tr>
<tr>
<td></td>
<td>2. Acme</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Gridley</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Brown &amp; Sharpe</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. Potter &amp; Johnson</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Paye</td>
<td></td>
</tr>
<tr>
<td>E HAND SCREW</td>
<td>1. Warner &amp; Swasey</td>
<td>.225</td>
</tr>
<tr>
<td></td>
<td>2. Pratt &amp; Whitney</td>
<td>.225</td>
</tr>
<tr>
<td>F Precision Grinding</td>
<td>1. EXTERNAL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Landis</td>
<td>.25</td>
</tr>
<tr>
<td></td>
<td>Norton</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Brown &amp; Sharpe Universal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. INTERNAL</td>
<td>.25</td>
</tr>
<tr>
<td></td>
<td>Heald</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bryant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. SURFACE</td>
<td>.25</td>
</tr>
<tr>
<td></td>
<td>Heald</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Blanchard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diamond</td>
<td></td>
</tr>
<tr>
<td>G Gear Cutters</td>
<td>1. Hobbers</td>
<td>.25</td>
</tr>
<tr>
<td></td>
<td>Barber &amp; Coleman</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gould &amp; Eberhart</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Shapers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fellows</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Millers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Brown &amp; Sharpe</td>
<td></td>
</tr>
<tr>
<td>Process Class of Work</td>
<td>Type and Make of Machine</td>
<td>Base Rate</td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>4. Generators</td>
<td>Gleadson</td>
<td>1905</td>
</tr>
<tr>
<td>1. Planer or</td>
<td>Shaper</td>
<td></td>
</tr>
<tr>
<td>2. Profiler</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Boring Mills</td>
<td>a. Horizontal</td>
<td>.25</td>
</tr>
<tr>
<td></td>
<td>b. Vertical</td>
<td></td>
</tr>
<tr>
<td>4. Punch Press</td>
<td></td>
<td>.225</td>
</tr>
<tr>
<td>5. Use Micrometers</td>
<td>and read blue prints</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A Master Trimmer</td>
<td>Design and pattern drafting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pattern making and lay-out</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cut and make up fittings for experimental jobs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Repair work, bodies, tops, slip covers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Requires all around man</td>
<td>.26</td>
</tr>
<tr>
<td>B Stock Cutter</td>
<td>Inspect and select stock</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lay-out for economy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Accuracy—No spoilage</td>
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</tr>
<tr>
<td></td>
<td>Speed—Fast work</td>
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</tr>
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<td></td>
<td>Leather cutter</td>
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<td></td>
<td>Electric machine cutter</td>
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<td></td>
<td>Buckram cutter</td>
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<td></td>
<td>Open body trim</td>
<td>.26</td>
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<td></td>
<td>Cushion build</td>
<td></td>
</tr>
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<td></td>
<td>stuff by hand</td>
<td>.25</td>
</tr>
<tr>
<td></td>
<td>Cushion build</td>
<td></td>
</tr>
<tr>
<td></td>
<td>stuff by press</td>
<td>.22</td>
</tr>
<tr>
<td></td>
<td>Door trim</td>
<td>.30</td>
</tr>
<tr>
<td></td>
<td>Sewing machine</td>
<td>.19</td>
</tr>
<tr>
<td></td>
<td>Paste</td>
<td>.20</td>
</tr>
<tr>
<td></td>
<td>Inspect and select stock</td>
<td></td>
</tr>
<tr>
<td>Process Class of Work</td>
<td>Base Rate 1905</td>
<td></td>
</tr>
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<td>-----------------------</td>
<td>---------------</td>
<td></td>
</tr>
<tr>
<td><strong>D Seat Cover.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fit and adjust</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sewing machine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lay-out and cut stock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seat cover maker</td>
<td>258</td>
<td></td>
</tr>
<tr>
<td>Seat cover helper</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Sewing machine</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td><strong>E Top Maker.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Covering and fitting curtains, etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Setting up bows and covering bows</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sewing machine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lay-out and cut stock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Build top complete</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Cover bows and set-up</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Sewing Machine</td>
<td>19</td>
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<table>
<thead>
<tr>
<th><strong>Work and Department.</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Case Hardening.</strong></td>
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<td>Heat treaters</td>
<td>225</td>
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<tr>
<td>Brazer</td>
<td>245</td>
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<td>General labor</td>
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<td><strong>Tool Department.</strong></td>
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<td>Toolmakers</td>
<td>325</td>
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<tr>
<td>Oilers and beltmens</td>
<td>20</td>
</tr>
<tr>
<td><strong>Wood Shop.</strong></td>
<td></td>
</tr>
<tr>
<td>Bench men</td>
<td>22</td>
</tr>
<tr>
<td>Machine men</td>
<td>24</td>
</tr>
<tr>
<td><strong>Paint Shop.</strong></td>
<td></td>
</tr>
<tr>
<td>Air brush</td>
<td>235</td>
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<tr>
<td>Finishing</td>
<td>25</td>
</tr>
<tr>
<td>Putty and sand</td>
<td>15</td>
</tr>
<tr>
<td>Stripers</td>
<td>25</td>
</tr>
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<td>Paint mixers</td>
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<td>Monogram men</td>
<td>30</td>
</tr>
<tr>
<td><strong>Final Assembly.</strong></td>
<td></td>
</tr>
<tr>
<td>Sub-assembly</td>
<td>23</td>
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TABLE XVI (CONTINUED)

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<td>Metal</td>
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<td>Repair Department</td>
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<td>Repairmen</td>
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<td>Wash room attendants</td>
<td>21</td>
</tr>
<tr>
<td>Heat and Power</td>
<td></td>
</tr>
<tr>
<td>Day fireman</td>
<td>165</td>
</tr>
<tr>
<td>Night fireman</td>
<td>20</td>
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<td>Inspection</td>
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<td>Finished parts</td>
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<tr>
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<td>Millwright</td>
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</tr>
<tr>
<td>Millwrights</td>
<td>235</td>
</tr>
<tr>
<td>Millwrights' helpers</td>
<td>185</td>
</tr>
<tr>
<td>Electricians</td>
<td>25</td>
</tr>
<tr>
<td>Yard men</td>
<td>15</td>
</tr>
<tr>
<td>Gate men</td>
<td>15</td>
</tr>
<tr>
<td>Night watchmen</td>
<td>125</td>
</tr>
<tr>
<td>Stores</td>
<td></td>
</tr>
<tr>
<td>Raw stock</td>
<td>175</td>
</tr>
<tr>
<td>Finished stock</td>
<td>175</td>
</tr>
<tr>
<td>First Aid</td>
<td></td>
</tr>
<tr>
<td>Janitors</td>
<td>15</td>
</tr>
<tr>
<td>Plumbers</td>
<td>20</td>
</tr>
<tr>
<td>Stock Movers</td>
<td></td>
</tr>
<tr>
<td>Move men</td>
<td>165</td>
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<td>Elevator men</td>
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<table>
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<th>Illinois</th>
<th>Michigan</th>
<th>New Jersey</th>
<th>Ohio</th>
<th>Penn</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Rank</td>
<td>Rank</td>
<td>Rank</td>
<td>Rank</td>
<td>Rank</td>
<td>Rank</td>
</tr>
<tr>
<td>Assemblers, axle, male</td>
<td>25.5</td>
<td>.634</td>
<td>12.5</td>
<td>.662</td>
<td>19</td>
<td>.755</td>
</tr>
<tr>
<td>Assemblers, body-frame, male</td>
<td>7</td>
<td>.771</td>
<td>3</td>
<td>.821</td>
<td>22</td>
<td>.746</td>
</tr>
<tr>
<td>Assemblers, chassis, male</td>
<td>25.5</td>
<td>.634</td>
<td>14</td>
<td>.661</td>
<td>24</td>
<td>.740</td>
</tr>
<tr>
<td>Assemblers, final, male</td>
<td>16</td>
<td>.688</td>
<td>7</td>
<td>.752</td>
<td>19</td>
<td>.755</td>
</tr>
<tr>
<td>Assemblers, frame, male</td>
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<td>.675</td>
<td>25</td>
<td>.609</td>
<td>8.5</td>
<td>.807</td>
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<tr>
<td>Assemblers, motor, male</td>
<td>18.5</td>
<td>.711</td>
<td>9.5</td>
<td>.718</td>
<td>16.5</td>
<td>.770</td>
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<tr>
<td>Automatic operators (lathe and screw-machine), male</td>
<td>14</td>
<td>.699</td>
<td>20</td>
<td>.650</td>
<td>7</td>
<td>.815</td>
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<td>.869</td>
<td>8</td>
<td>.751</td>
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<td>1.025</td>
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<td>Drill-press operators, male</td>
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<td>.652</td>
<td>24</td>
<td>.621</td>
<td>23</td>
<td>.743</td>
</tr>
<tr>
<td>Forge-shop helpers, male</td>
<td>28</td>
<td>.551</td>
<td>27</td>
<td>.565</td>
<td>16.5</td>
<td>.770</td>
</tr>
<tr>
<td>Gear-cutter operators, male</td>
<td>18</td>
<td>.682</td>
<td>16</td>
<td>.657</td>
<td>15</td>
<td>.791</td>
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<td>Grinding-machine operators, male</td>
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<td>.729</td>
<td>18</td>
<td>.653</td>
<td>11</td>
<td>.793</td>
</tr>
<tr>
<td>Helpers, male</td>
<td>30</td>
<td>.518</td>
<td>29</td>
<td>.451</td>
<td>29</td>
<td>.848</td>
</tr>
<tr>
<td>Inspectors, male</td>
<td>27</td>
<td>.623</td>
<td>17</td>
<td>.656</td>
<td>27</td>
<td>.711</td>
</tr>
<tr>
<td>Laborers, male</td>
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<td>.522</td>
<td>28</td>
<td>.497</td>
<td>30</td>
<td>.604</td>
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<tr>
<td>Lathe operators, male</td>
<td>12.5</td>
<td>.711</td>
<td>22</td>
<td>.644</td>
<td>14</td>
<td>.762</td>
</tr>
<tr>
<td>Machinists, male</td>
<td>10</td>
<td>.715</td>
<td>23</td>
<td>.658</td>
<td>5</td>
<td>.847</td>
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<tr>
<td>Metal finishers, male</td>
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<td>.868</td>
<td>1</td>
<td>1.008</td>
<td>4</td>
<td>.862</td>
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<td>Metal panelers, male</td>
<td>1</td>
<td>.872</td>
<td>2</td>
<td>.891</td>
<td>19</td>
<td>.755</td>
</tr>
<tr>
<td>Milling machine operators, male</td>
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<td>.680</td>
<td>21</td>
<td>.645</td>
<td>15</td>
<td>.775</td>
</tr>
<tr>
<td>Painters, general, male</td>
<td>15</td>
<td>.690</td>
<td>11</td>
<td>.717</td>
<td>10</td>
<td>.795</td>
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<tr>
<td>Occupation</td>
<td>New York Rank</td>
<td>New York $</td>
<td>Illinois Rank</td>
<td>Illinois $</td>
<td>Michigan Rank</td>
<td>Michigan $</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>---------------</td>
<td>------------</td>
<td>---------------</td>
<td>------------</td>
<td>---------------</td>
<td>------------</td>
</tr>
<tr>
<td>Polishers and buffers, male</td>
<td>5</td>
<td>.860</td>
<td>2</td>
<td>.926</td>
<td>1</td>
<td>1.008</td>
</tr>
<tr>
<td>Sanders and rough-stuff rubbers, male</td>
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<td>.843</td>
<td>4</td>
<td>.809</td>
<td>12</td>
<td>.792</td>
</tr>
<tr>
<td>Sheet-metal workers, male</td>
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<td>.767</td>
<td>9.5</td>
<td>.718</td>
<td>6</td>
<td>.816</td>
</tr>
<tr>
<td>Tool and die makers, male</td>
<td>8</td>
<td>.770</td>
<td>5</td>
<td>.754</td>
<td>3</td>
<td>.920</td>
</tr>
<tr>
<td>Top builders, male</td>
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<td>.862</td>
<td>6</td>
<td>.735</td>
<td>8.5</td>
<td>.807</td>
</tr>
<tr>
<td>Woodworking-machining operators, male</td>
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<td>.647</td>
<td>15</td>
<td>.659</td>
<td>28</td>
<td>.669</td>
</tr>
<tr>
<td>Ratio of high to low rates</td>
<td>1.68</td>
<td></td>
<td>2.22</td>
<td></td>
<td>1.69</td>
<td></td>
</tr>
</tbody>
</table>

1 From National Industrial Conference Board, *The Economic Status of the Wage Earner in New York and Other States*, (, p. 121) Data covers 144,352 wage earners, or 35.6% of industry total.
### TABLE XVIII

A Comparison of Opinions

<table>
<thead>
<tr>
<th>Factor</th>
<th>Executive Group</th>
<th>Committee Combined</th>
<th>Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Time Usually Required to become Highly Skilled in Occupation.</td>
<td>24.7</td>
<td>18.6</td>
<td>20.4</td>
</tr>
<tr>
<td>2. Time Usually Required for a Skilled Man to Adapt Himself to Work..</td>
<td>6.4</td>
<td>5.3</td>
<td>6.0</td>
</tr>
<tr>
<td>3. Scarcity of Labor Supply........................................</td>
<td>4.9</td>
<td>5.1</td>
<td>5.0</td>
</tr>
<tr>
<td>4. Difficulty for an Employe to Secure Similar Work Elsewhere...........</td>
<td>4.4</td>
<td>5.6</td>
<td>4.8</td>
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<tr>
<td>5. Educational Requirements</td>
<td>10.6</td>
<td>10.2</td>
<td>10.4</td>
</tr>
<tr>
<td>6. Prevailing Rate of Pay</td>
<td>4.1</td>
<td>4.2</td>
<td>4.1</td>
</tr>
<tr>
<td>7. Degree of Skill and Accuracy Required...............................</td>
<td>10.0</td>
<td>10.7</td>
<td>10.3</td>
</tr>
<tr>
<td>8. Necessity of Constantly Facing New Problems - Intelligence..........</td>
<td>9.0</td>
<td>5.9</td>
<td>7.8</td>
</tr>
<tr>
<td>9. Cost of Errors - Unintentional, Spoiled Work, etc....................</td>
<td>6.2</td>
<td>6.7</td>
<td>6.4</td>
</tr>
<tr>
<td>10. Dependence that Must be Placed upon Employe's Integrity..............</td>
<td>7.4</td>
<td>7.9</td>
<td>7.6</td>
</tr>
<tr>
<td>11. Dirtiness of Working Conditions...................................</td>
<td>3.2</td>
<td>3.7</td>
<td>3.4</td>
</tr>
<tr>
<td>12. Exposure to Health Hazards........................................</td>
<td>3.1</td>
<td>3.7</td>
<td>3.3</td>
</tr>
<tr>
<td>13. Exposure to Accident Hazards.......................................</td>
<td>3.4</td>
<td>3.9</td>
<td>3.7</td>
</tr>
<tr>
<td>14. Physical Effort Required</td>
<td>3.1</td>
<td>4.3</td>
<td>3.6</td>
</tr>
<tr>
<td>15. Monotony of Work....</td>
<td>2.5</td>
<td>4.2</td>
<td>3.2</td>
</tr>
<tr>
<td>Total..................................................................</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
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</table>

Relative Value of Factors Influencing the Worth of an Occupation

---

TABLE XIX

National Electrical Manufacturers Association (NEMA)
Job Evaluation Plan (39, p. 2)

Points Assigned to Factors and Key to Grades

<table>
<thead>
<tr>
<th>FACTORS</th>
<th>DEGREES AND POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st 2nd 3rd 4th 5th</td>
</tr>
<tr>
<td>2. Experience</td>
<td>14 28 42 56 70</td>
</tr>
<tr>
<td>3. Initiative and Ingenuity</td>
<td>14 28 42 56 70</td>
</tr>
<tr>
<td>EFFORT</td>
<td></td>
</tr>
<tr>
<td>4. Physical Demand</td>
<td>10 20 30 40 50</td>
</tr>
<tr>
<td>5. Mental and/or Visual Demand</td>
<td>5 10 15 20 25</td>
</tr>
<tr>
<td>RESPONSIBILITY</td>
<td></td>
</tr>
<tr>
<td>6. Responsibility for Equipment or Process</td>
<td>5 10 15 20 25</td>
</tr>
<tr>
<td>7. Responsibility for Material or Product</td>
<td>5 10 15 20 25</td>
</tr>
<tr>
<td>8. Responsibility for Safety of Others</td>
<td>5 10 15 20 25</td>
</tr>
<tr>
<td>JOB CONDITIONS</td>
<td></td>
</tr>
<tr>
<td>10. Working Conditions</td>
<td>10 20 30 40 50</td>
</tr>
<tr>
<td>11. Hazards</td>
<td>5 10 15 20 25</td>
</tr>
</tbody>
</table>

ESTABLISHMENT OF GRADE FROM POINT VALUES

The total point score of the job determines the job grade in accordance with the following table:

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<th>Score Range</th>
<th>Grade</th>
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</thead>
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<tr>
<td>Up to 129</td>
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<tr>
<td>140-161</td>
<td>11</td>
</tr>
<tr>
<td>162-183</td>
<td>10</td>
</tr>
<tr>
<td>184-205</td>
<td>9</td>
</tr>
<tr>
<td>206-227</td>
<td>8</td>
</tr>
<tr>
<td>228-249</td>
<td>7</td>
</tr>
<tr>
<td>250-271</td>
<td>6</td>
</tr>
<tr>
<td>272-293</td>
<td>5</td>
</tr>
<tr>
<td>294-315</td>
<td>4</td>
</tr>
<tr>
<td>316-337</td>
<td>3</td>
</tr>
<tr>
<td>338-359</td>
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</tr>
<tr>
<td>360-381</td>
<td>1</td>
</tr>
</tbody>
</table>

USE OF JOB RATING PLAN

In using this job plan, bear in mind that its prime purpose is to rate jobs, not workers. Individual human differences and abilities should not be reflected in the ratings of jobs.
### TABLE XX1

**Variations in Labor Rates and Income Among Competitive Plants in a Given Industry in a Given State**

Survey Made in May, 1936

<table>
<thead>
<tr>
<th>Type of Labor</th>
<th>Company</th>
<th>Hours per Week</th>
<th>Hourly Rate</th>
<th>Weekly Rate</th>
<th>Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common</td>
<td>A</td>
<td>40</td>
<td>43</td>
<td>$17.20</td>
<td>High (1) $18.80</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>40</td>
<td>43</td>
<td>17.20</td>
<td>(1) 18.40</td>
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</table>

I, John Thompson Elrod, was born in Dallas, Texas, October 4, 1914. I received my secondary education in the public schools of Santa Monica, California and Houston, Texas. My undergraduate training was obtained at the A. & M. College of Texas, from which I received the degree Bachelor of Science, Mechanical Engineering in 1936. I received the degree Master of Science in Engineering from Purdue University in 1939. I have been employed in industry by the Allis-Chalmers Manufacturing Company, the General Motors Corporation, and the Msco Derrick and Equipment Company. I held the position of Assistant Professor at the A. & M. College of Texas in 1946, and have been Assistant Professor (1947-49) and Professor (1949 to date), at the University of Houston where I am Chairman of the Industrial Engineering Department. I have been on leave for two years from this position to complete the requirements for the degree Doctor of Philosophy.