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WOMEN LEARNING RADIOGRAPHIC INTERPRETATION: 
A STUDY OF PRACTICAL TEACHING AND LEARNING

DISSERTATION

Presented in Partial Fulfillment of the Requirements for 
the Degree of Doctor of Philosophy in the Graduate 
School of The Ohio State University

By

Charles Allen Shaffer, B.S., M.A.

* * * * *

The Ohio State University
1996

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ABSTRACT

Studies of the teaching and learning of the interpretation of medical radiographs have been conducted with cohorts of male medical students, and with methods based in what has been termed "malestream" sociology. In cases where feminist, postmodern, or other theorists have worked in representation generally or in medical imaging specifically, they have begun their work in the discourse of their disciplines rather than in the everyday lives of medical teachers and students.

In this study, a combination of phenomenological and feminist epistemologies led to a methodology featuring interviews and observations of a group of teachers of veterinary medicine and a cohort of female students learning to "read" medical x-ray films, coupled with audio recordings of students and teachers during formal class sessions and informal study sessions which were transcribed for analysis.

The analysis of this data was accomplished in two readings; the first, along the general lines of ethnomethodology and conversation analysis; the second, tracing the extralocal influences on this everyday practice of teaching
and learning, along the lines of the work of Dr. Dorothy Smith.

In the first reading of the data, a notable conversational construction was noted, in which women would recount in detail a segment of an incident in order to illustrate their judgement of a situation and invite the hearer’s assessment. These were termed “replay structures” in the discussion, and bear some further investigation. Details of the construction of measurements and “normal” vs. “abnormal” structures in the interaction of the students were transcribed and discussed, as well as the absence of blatant gender references in the interaction.

The second reading of the data traces the economic and hierarchical imperatives that “pre-shape” the everyday, practical interaction of the teaching and learning of medicine. Replay structures are discussed as possibly involved in the maintenance of medical collegiality, or conversely as a women’s reworking of professional interaction. These women’s everyday involvement in the workings of a gendered and economically shaped environment is pointed out through the data. This study discusses producing inquiries by male researchers that are useful in contributing to feminist knowledge.
ACKNOWLEDGMENTS

In a very difficult moment in their lives, several dozen veterinary students allowed me to attend their classes, record their study sessions, ask questions that took them from their work, and take time from them that they did not have to spare. Only one can be named; Jennifer Fox, in addition to the things listed above, searched medical literature, thought with me about this project, and read through the final product. Faculty, likewise, under the triple pressures of their service, research and teaching demands, made time for me whenever and wherever I asked. The administration of the College, in addition to allowing access for this study, allowed me the freedom to rearrange time to accommodate the data collection. For all of these gifts, I am deeply grateful.

My mentors in this work are as diverse, scholarly, and as dedicated as any I know. Dr. Suzanne Damarin, my advisor, has in all times and places lived out her philosophical and scholarly commitments rather than simply teach them. Those of us fortunate enough to be her students have been her
colleagues from the first day; an unbelievable privilege. Dr. Diane Gerken first pointed the way for me through graduate work; it was through her ruggedly practical advice and support that I found and kept on the path. More than that, she has shown me that true scholarship struggles fairly with all ideas that are seriously presented, regardless of disciplinary boundaries. Dr. Douglas Macbeth introduced me to the literature and practice of ethnomethodology, and though he might disagree with what I have made of it, he has all my thanks for that introduction. Dr. David G. Horn did me the inestimable favor of stepping in on this work at a late hour, and lending his scholarship to that stage of the study. And finally, Dr. Dorothy Smith gave me the gift of her time and counsel at a moment that turned out to be more critical than any of us could have known. She is, as her work shows her to be, possessed of a great heart as well as great scholarship. No one has ever been more richly blessed with mentors, or had as impossible a task as finding words of thanks.

To my mother, Phyllis Cranston, go not only the thanks of a son, but also the thanks that go with her diligent and thoughtful efforts in the transcribing of large parts of the data of this study; to Ralph Cranston, my thanks for providing the many resources that went into that transcription, and for his quiet understanding - from having traveled this road himself. Likewise, my thanks to my in-laws, Dr. Franklin H. Beck and Jean Cranston Beck (who suffered through the preparation of a dissertation almost 50 years
ago) for their support and encouragement.

Colleagues, friends, co-workers and teachers who were vital to both my life and this work rise before me as a legion, each deserving of a recounting of their special place; they are known, loved and honored by me, and as they read these lines, they will recognize both my debt to them and my anguish that the fear of omitting one has won out over the desire to name them all.

Finally, there will live in this work forever a testament to the power of one person to change lives; for one person to rescue from certain death the dreams, hopes, and contributions of another. That person is my partner, Marian L. Beck, and whatever good you find in this work is her gift to you, through her inestimable gift to me.
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Chapter 1

Introduction

The interpretation of radiographs (x-ray films) by doctors holds a special place in the iconography of modern society; yet almost nothing is known about the practical, everyday pedagogy that prepares those who perform that interpretation. As a second noticing, though medical education and medical school culture have both been studied, the overwhelming majority of those studies were performed when only a handful of women attended medical schools, or focused on gender difference with previously documented male action as the norm. This study will explicate, for the first time, the practical actions of a small cohort of women learning and being taught the interpretation of radiographs, along with a description of their learning environment both from their words and from participant observation.
The iconic radiograph

The films that medical people place on a "light box" for interpretation are called "radiographs," because they are graphic images created by radiation. "X-rays" are the invisible waves that create the pictures, not the pictures themselves. (This nice distinction in terms is one of the first learnings of the novice radiographer, as will be taken up later). Although most of this study will be taken up with the construction of meanings that radiographs have to medical persons, a few words are in order about their meaning to the lay person.

One of the surgeons responding to this study told me that the radiograph was "a hard copy of an invisible process" - not the physical process of imaging, but the ineffable process of the doctor's penetration of the body of the patient and coming to know what is happening within.

In this, she agrees without consultation with the ideas of Richard Swiderski (1976), that there is an "idiom of diagnosis" that can be traced back to the shamanistic taking-on of the symptoms of the patient. He says;

Though the physician and the patient must share the experience of disease, their relationship is governed by a dialectic of knowing that is never firmly balanced in favor of either. The patient's illness is a mystery, which the physician probes with all his being. The physician's mysterious understanding of the illness can only be verified in the tangible signs which the patient alone knows and for which the physician earnestly looks. The act of diagnosis, the gnosis or inspiration of knowledge that goes through the body and is therefore thorough, is the primary flash of continuity linking the physician with the patient. (1976, p.3)
Swiderski continues this thought by outlining instances from the history of medical illustration where various moments of observation, such as examining urine or listening with the stethoscope, have been used to advance this dialog between patient and physician.

The idiom of diagnosis can be represented visually. Constructions of the idiom of diagnosis in the public space of visual representation are themselves part of the idiom. They are its maps, ordering and defining the physician patient relationship in forms which are appropriately well fashioned. The idiom of diagnosis, in its visual representations, has a visual form which is unique. The observer of the representation is always the patient looking into the scene surrounding the physician. The eye of the patient is merged, in that way, with the eye of the physician. In these representations the eye forms the bridge that was once formed by the entire body. These pictures show the physician’s mastery and the patient’s comfort in that mastery. They make disease into visual knowledge that is open and shared, and suggest that disease is finite. (op.cit., p.5)

Following this line of thought, it is easy to find examples of modern culture where the radiograph’s interpretation is used in this way. Whenever medicine is depicted in popular still or motion media, the physician looking at the radiograph is used in this ancient way. For example, the entire opening sequence of the highly popular television series “ER” is based on the coloration, identifying markers, and monochromatic gradations of the radiograph.
Swiderski says that although some specifics have changed over time, "the idiom of diagnosis is a basic visual mode that continues to express the idea of diagnosis under many different cultural circumstances." (p.4)

These pervasive, longstanding links to ineffable or mystical knowledge may explain another statement from an expert respondent to this study. He said, of learning to read radiographs, "I couldn't wait to be initiated into the secrets of medicine." To me, the otherwise inexplicable lack of interest by lay sociologists and educators in the pedagogy of radiographic interpretation might be linked to these notions of mystery. I did not choose the title "iconic radiograph" lightly; I believe that the reading of radiographs is invested with meaning beyond the practical accomplishment of the task, which has discouraged investigation. Even Michael Polanyi, himself a product of the pedagogy of radiography, abdicates speaking of it at the critical moment:

Think of a medical student attending a course in the x-ray diagnosis of pulmonary diseases. He watches in a darkened room shadowy traces on a fluorescent screen placed against a patient's chest, and hears the radiologist commenting to his assistants, in technical language, on the significant features of these shadows. At first, the student is completely puzzled. For he can see in the x-ray picture of a chest only the shadows of the heart and the ribs, with a few spidery blotches between them. The experts seem to be romancing about figments of their imagination: he can see nothing that they are talking about. Then as he goes on listening for a few weeks, looking carefully at ever new pictures of different cases, a tentative understanding will dawn on him; he will gradually forget about the ribs and begin to see the lungs. And eventually, if he perseveres intelligently, a rich panorama of significant details will be revealed to him: of physiological variations and pathological changes, of scars, of chronic infections and signs of acute disease. He has entered a new world. He still sees only a fraction of what
the experts can see, but the pictures are definitely making sense now and so do most of the comments made on them. He is about to grasp what he is being taught; it has clicked. Thus, at the very moment when he has learned the language of pulmonary radiology, the student will have also learned to understand pulmonary radiograms. The two can only happen together. (1958, p.101)

This description fails to address the practical pedagogy of the darkened radiography teaching room; instead, knowledge is romantic and imaginative, until it is “revealed” to the student and he enters a new world. Polanyi himself later describes such knowledge as "ineffable," invoking again a certain mysticism in its production. At the same time, however, he points toward a method of knowing about the pedagogy that my study takes as a serious guide; that in the comments made about the films, in the “language of . . . radiology,” in the talk, is to be found the moment of learning.

One final return to Swiderski’s thought confirms the nature of the study to be made of this pedagogy. He says:

There is a great deal more that should be said about the dimensions of the idiom of diagnosis, but these things can only be said on the basis of ethnographic evidence, by the study of how the idiom is deployed in situations of medical examination today. No doubt it will be possible to learn very specifically how the idiom smells, sounds, feels, and tastes today, and perhaps some evidence can be gathered concerning its typical sensations in the past. The persistence of the idiom’s visual form would tend to suggest that many contemporary practices are modified holdovers. Once the needed investigations are made, more can be said. But then, mere saying probably would not suffice. (op.cit., p.13)
"Mere saying" will likewise not be enough for a study of radiologic pedagogy, although the "mere saying" of theoretical studies will exclusively form the literature review of the subject in Chapter two. This study will use feminism and phenomenology, and some of the research techniques of ethnography, ethnomethodology and conversation analysis, as ways to look at the deployment of the idiom of diagnosis (as described by Swiderski) in the pedagogy of novice female radiographers.

Purpose of the study

This study promises only a small outcome, but from an entirely new viewpoint. In that sense, its usefulness lies only in its linkage to future studies conducted with the same viewpoint, building to a corpus of data.

The study of this pedagogy will limit itself to the documentable, displayable methods of women helping each other learn radiography, and their accounts of this process. In that, it will specifically exclude theories of visual interpretation, teaching and learning, or psychology as organizing features except as those theories are invoked by the parties to the pedagogy in their explanations or ordering of their actions. In this regard, this study is informed by and seeks to follow research methods arising from phenomenology and feminism.

It cannot be said that this study hopes to produce grounded theory (c.f., Strauss and Corbin, in Denzin and Lincoln, 1995), or to test theory currently
published. It may be that occurrences and noticings in the study will suggest reference to theory, or may even seem to confirm or deny theoretical positions, but those suggestions or thought provocations are incidental to the study and not its goal.

In a similar way, this study is influenced and informed by feminist work without seeking to specifically generate grounded feminist theory or confirm/deny feminist theoretical work. This study has selected its sample and its work site in harmony with feminist calls for more unmotivated studies of women’s lives (Harding, 1991). This study calls for some of its inspiration on the work of Dorothy Smith (c.f. Smith, 1974, 1978, 1979, 1981, 1983, 1984, 1987, 1988, 1990a, 1990b), who has chosen to blend worksites of feminist consequence with her commitment to phenomenology, without attempting the level of “theory blending” that her work entails.

This study will “place into evidence” the methods, practices and accounts of women teaching and learning radiographic interpretation. It is assumed, from the researcher’s belief in the gendered nature of society, that placing into evidence will include evidence of gender inequalities along with the evidence of the practical actions of radiologic pedagogy - but it is not promised. The study’s commitment is to use the everyday world of these students and teachers as its organizing principle, and not the beliefs and theories of the researcher or disciplinary communities.
It is also the case that other workers will find evidences in this study that were not found by this researcher. This methodology is chosen because of that certainty, and in accordance with one of the purposes of this study; that men attempting to create research findings that are truly useful to women should make their work accessible, reinterpretable and declaredly partial. To me, the provision of transcript, the non-imposition of theory on these women, and the avoidance of "generalizable findings" through the use of phenomenological techniques accomplishes that further goal of this study.

Research questions

*Is radiographic interpretation only one enterprise?*

It is tempting to think of any expertise as one skill, but observation of novice radiographers (especially at different stages in their career path) might help break down the actual practice of radiographic pedagogy into different moments and purposes.

*What are the uses of a radiograph to those engaged in its interpretation?*

To the patient, the radiograph is an intensely personal item, to the point that they may often refer to them as "my pictures." To the clinical person trying to formulate a plan for treatment of a particular disease state in a patient, the radiograph likewise fits into a specific course of action. But to the student, the radiograph may fit into quite a different (but no less
purposeful) course of action. This study should look for and explicate those different courses of action.

*How do teachers/students construct accounts of the process of learning and teaching interpretation? How do they describe their conduct with reference to rules, norms, values, etc.?*

Interviews with students and teachers will not be collected solely for their value as "data" or as some sort of encapsulated truth. Rather, these accounts will be a topic for this study in their own right, showing how rules, norms and theories serve to aid in the construction and understanding of accounts.

*What are the observed differences between novice and expert interpretation? Between instructed and group assisted interpretation?*

Many studies pretend to have access to the cognitive aspect of teaching, learning or practice, when in fact all that we are sure of is what is demonstrated in the world. Therefore, this study will take as data the demonstrated (through interaction) methods of interpretation of experts and novices, both in expert-novice groups and novice-novice groups, and the accounts of their methods and practice that they formulate in interviews with the researcher.
How do novices make the "instructions" useful in their reading of radiographs?

Perhaps the most interesting part of this study will be to see exactly how students use their prior instruction and observation of experts as explicit resources in the interpretation of radiographs, and how they demonstrate for others that they are following previous instruction in their interpretation.

How have previous studies failed to describe the actual teaching/learning/practice of radiographic interpretation?

The job of the literature review in this study is to show the radically different emphases of other studies of radiologic pedagogy. Some studies have looked at the culture of medical school, some have applied visual literacy or semiotic theory, and most from within medicine have applied some version of behavioral learning theory and instructional systems management to the pedagogy. Until now, none has taken the approach of describing the methods used by students and teachers in the classroom. Ethnomethodological studies have looked at scientific and medical work, but usually only at the level of practice - while ethnomethodological studies of interaction in learning contexts have concentrated on K-12 sites.
Does gender surface explicitly in members’ accounts or actions in the learning and teaching situation? Is women’s experience ever an explicated resource in this interaction?

One would presume that these issues are present, but it is one of the great risks of this study to presume that they would appear a) during the admittedly small study period; b) with this particular small cohort of women; c) recognizably and analyzably by the researcher; and d) externally in the interaction so as to be captured and transcribed.

How is the correspondence between radiographically visualized structures and textbook anatomy taught and learned?

Were it possible to ask all teachers of radiology what one question they would most like answered, this would be the one. As will be related later in the study, all of the teachers interviewed thought deeply about this question, and were in the middle of their own lifelong experiments to answer it. Although this study does not pretend to be about generating an answer, it would take their question as a “sensitizing concept” in looking at interaction in radiologic pedagogy.

In a further sense, such a study as this is about the generation of research questions more than it is about answering them. From “the things themselves,” as Husserl and other phenomenologists recommended, should come the research questions - and the current lack of studies of practical
radiologic pedagogy makes the generation of anything like a satisfying list of questions impossible. As to theory, it is best positioned through the words of Harvey Sacks

Our business will be to proceed somewhat differently. We will be using observation as a basis for theorizing. Thus we can start with things that are not currently imaginable, by showing that they happened. We can then come to see that a base for using close looking at the world for theorizing about it is that from close looking at the world we can find things that we could not, by imagination, assert were there. We would not know that they were 'typical'. Indeed, we might not have noticed that they happen. (Sacks, in Atkinson and Heritage, 1984, p.25)

Scope of the study

Even today, with all of the new medical imaging technologies, 80% of the work of the expert radiologist is with the simplest and oldest technology - plain film radiography. There are over 130 million conventional diagnostic radiographic procedures performed each year in the United States in human medicine, and over a billion films are exposed. Veterinary medicine, dentistry, and podiatry add large numbers to this total.

Arguably, all of the licensed medical practitioners in the United States are involved in interpreting these images - at least, they are trained to do so. In reality, that job is often left to specialists in the field - of which there are thousands in human medicine and hundreds in veterinary medicine. After these images are interpreted by specialists, and their interpretation relayed to the primary practitioner, the information is again relayed by that practitioner
to the patient and thence to family and friends. This study will confine itself

to the novice radiographer, and leave the work of the expert radiographer and
the accomplished medical clinician to another day.

For reasons of access and convenience, only students and teachers of
veterinary medicine are involved as respondents. These students have been
as carefully selected and trained as all other medical students, and are in all
conceivable ways as representative as anyone of novice radiographers. One
could say that their task is more complex than that of human medical
students, as they have the additional burden of recognizing the species
represented in each radiograph while their counterparts in human medicine
do not. The teachers are all specialists (either in surgery, radiology, or
anatomy), and have followed the same lengthy career path as their
counterparts in human medicine.

Because of the rise of modern veterinary medicine to parity with
human medicine in technical as well as pedagogic capabilities, there is quite
literally no difference between the radiology classrooms and reading rooms of
one profession compared to the other. In human and animal radiography, the
interpretation of films is taught and learned at a distance from the patient.

Secondly, the study is focused on novice radiographers who are female.
About half of human medical students and three-quarters of the veterinary
students are female. Because the majority of the professors of veterinary
medicine are still male, it was not representative or informative to confine
those interviews to female teachers; however, the majority of those faculty interviewed are female.

Introduction to the study site

The site for this study is the College of Veterinary Medicine of The Ohio State University, the largest college of veterinary medicine in North America. About 130 students are enrolled in each year of the four-year professional curriculum, taught by a faculty of about 100. Currently, about 73.4% of the student body is female, and about 45% of the faculty are women.

Students admitted to the veterinary curriculum have an average grade point of 3.43 on a four-point scale, and GRE scores above 1500. Each year, about three students are turned away for each one admitted. Of the 30 colleges of veterinary medicine in North America, this college is consistently rated in the top five to ten, and so is sought after by prospective students.

A brief orientation to the veterinary curriculum is in order, particularly with reference to the radiology instruction given, its sequencing and extent. This curriculum is nominally the same as that in all medical schools following a "traditional" curriculum. Some human medical schools are now following a "problem-based" curriculum, which differs in instructional technique, but not in sequencing.

In the first year, these students study the anatomy of the dog, cat, horse and cow by lecture and laboratory dissection. At this college, audiovisual
media are quite well developed, and many computer generated slides of
anatomical structures are shown in class to highlight structures to be dissected
in lab. The laboratory sessions place students in groups of 3-4 with a cadaver
to be dissected. In this lab, there are radiograph viewers along the walls, and
radiographs of the areas being dissected are routinely placed on the viewers so
that students can correlate film with actual structure. In reality, as one
respondent told me, students ignore the films until exam time - when only
the labeled structures are rotely memorized.

In the second year of this veterinary curriculum, students move from
studying the microscopic or cellular level of the body, to courses centered
around body systems, such as the musculoskeletal, the digestive, etc. During
these systems courses, they are exposed first to the normal radiographic
anatomy of each of these systems, and then to the most common or textbook
cases of disease that can be seen radiographically in these systems.

This pedagogy is accomplished in three ways; first, through the most
standard and ordinary experience in the lecture hall where slides of anatomy
and diseases are projected to the entire group of one hundred and thirty;
second, in "laboratories," where representative cases of both normal and
pathological states are provided for student viewing; and finally, in small
group sessions where students discuss "typical" cases among themselves,
attempting to arrive at a complete description of the anatomy and at a
diagnosis of pathological condition.
Each of these sites of instruction provides a different opportunity for inquiry that this study will make use of. One could characterize the first instructional site as that of expert speaking to novice in a one-way communication, the second as expert speaking to novice in a two-way communication, and the third as novice to novice. Yet a fourth method of instruction comes into play, however, when assessing the role of texts and their influence on shaping the pedagogy of the three former sites. These texts, whether the highly formalized text of the medical textbook, the sketchy outlines provided as student notes, or the avuncular maxims associated with medical student learning, all enter into and shape the pedagogy of radiologic interpretation.

In the third year, having had normal anatomy organized both in the traditional anatomic way and by body systems, and having had experience with the common radiographic indications of disease in each system, the students are then "rotated" through the radiology service. Part of this pedagogy is the learning of the most mundane techniques of the production of radiographs, but students also are exposed during this time to the ordinary flow of material through the radiology department - not the carefully selected "teaching films," but a stream of films that may represent either normal or diseased patients which require actual interpretation. During this experience, students are encouraged to engage in "trial runs" of interpretation, reading films on their own without the assistance of the instructor. The instructor is
then available as a confirmator or an elaborator at the end of that exercise. The style of instruction in this part of the student’s experience is Socratic in the extreme, as opposed to the more expository style of the previous experiences.

Finally, in the senior year, students begin to interpret radiographs as a seamless part of the work of the clinic, using them to decide next courses of action instead of interpreting them as a classroom exercise. The instructor is still available during this process, so that it may be said that the student’s hand is still guided at this stage. (There is a large literature on the classroom as simulation or simulacrum, which will not be reviewed in this study, but which bears on this notion of pedagogy in the senior year.)

Because this study is about the pedagogy of radiographic interpretation, the experiences of the senior year are not included in this study. It seems to me that these experiences in the senior year are closer to those studies made by those studying the everyday work of scientists in practice (c.f. Lynch, 1985b; Lynch and Woolgar, 1990; and Latour and Woolgar, 1986) than to studies of classroom or small group learning, because of the senior veterinary students’ ability to engage easily in the “shop talk” of medicine, and so the experiences of the seniors are not included here. All of the other sites mentioned are investigated in this study and data are generated from those sites. Because of the non-interactional nature of the lecture experience, it is treated in this study more like the texts previously mentioned, and the main part of this
study focuses on the interactive learning of the second and third year of the veterinary curriculum.
Chapter 2

Review of Related Literature

The literatures of education, sociology, feminism and medicine all contribute to the shape of this study, and confirm the absence of the investigation of the practical actions of women learning and teaching medical skills. In this review, the literature will be discussed from the inside out - beginning with the studies generated from within the medical community, working out to the more theoretical and to those done by more distanced observers, and returning to studies in science and education done by methods which begin from the everyday world.

This literature review will cover a wide range of work, done from many theoretical perspectives; in doing so, it may unintentionally seem to caricaturize extensive and complicated literatures through insufficient elaboration. It will also lack focus that narrows to a specific point, as the purpose is to outline or encircle an absence - namely, the absence in the
literature of close investigation of the everyday world of medical visual learning.

Finally, there is a specific use of the word "theory" that must be made clear to the reader of this study. It is necessary for my purposes to make a distinction between thought and study which explicitly begins in the everyday world, and thought and study which relies on experience and knowledge of the everyday world, but explicitly begins in the discourse of a discipline. When I characterize work as theory, or someone as a theorist, it is a characterization of a taxonomic nature and is in no way pejorative.

Medical Literature

The studies of radiology education from within medicine have been profoundly shaped by the same positivist ideas that shape most speaking about science among scientists. The radiograph is presumed to hold a fixed stock of information, which is retrievable in various degrees depending upon the skill and training of the reader. Under this notion, impediments to the full retrieval of that indwelling information are generated by physical limitations such as room noise, excessive illumination, or other distractions; lack of visual acuity or discrimination; bias due to anecdotal information; or other factors which generate "noise" that obscures the "clean transmission" of information from film to viewer (Bass and Chiles, 1990; Berbaum, et.al., 1988, 1986, 1988, 1990, 1985; Blesser and Ozonoff, 1972; Doubilet and Hermann, 1981;
Good, 1990; Herman and Hessel, 1975; Kundel, 1983; Kundel and Nodine, 1983, 1983a, 1978; Rackow, et.al., 1987; Schreiber, 1963; Swets, 1985) These ideas have shaped many if not all of the medical community's studies of learning to read radiographs.

Some medical studies have focused on repeatability - again standing on the view that the information in the radiograph is an immutable quantity. I like to call these studies "do you see what I see?" studies, after the line in the old Christmas carol, because their point is to demonstrate that indeed, trained observers will see radiographs in the same way.

It is striking, in reviewing these studies, to see that the idea of the professional competence of the radiologist being the ability to deal with the indwelling uncertainties expressed by the commonly used term "radiographic interpretation" has been all but eliminated. These studies, rather, make a negative of that uncertainty, placing the blame for it in distraction and lack of skill. (It will be interesting, in Chapter 5, to see how the actual practice of radiology education sharply differs in its view of uncertainty and its management.)

The literature describing the pedagogy of diagnostic visual interpretation is largely about radiology, as would be expected. In this literature, signal processing theory from electronic engineering is used as the primary conceptual basis for the investigation of observer error. The pathological spots in the radiograph must be sensed and retrieved out of the
"noise" overlying them - that is, all of the other, non pathological information in the radiograph (Kundel and Nodine, 1978; Swenssen, 1985; Myles-Worsley, Johnston and Simons, 1988) Studies conducted in this manner have shown "observer error" to be 20-40% in radiology (Norman, Brooks, 1992; Coblentz and Babcock, 1992) and as much as 53% in histologic pathology (Jones and Cash, 1984).

Some studies of radiologic interpretation have focused on the role of the clinical history in changing the "accuracy" of interpretation. Throughout these studies, the provision of a consistent clinical history always yielded more accurate interpretations (Berbaum, et.al., 1988,1986; Schreiber, 1963; Doubilet, 1981; Good, et.al., 1990; Swensson, 1980)

Investigators using the cognitive psychology approach have also investigated radiologic interpretation, replicating studies done on chess masters and other expert performers. Their studies propose that "radiologic expertise is based on two kinds of knowledge: knowledge of the characteristic features of clinically normal exemplars . . . and knowledge of the particular set of uncharacteristic features that signal pathology" (Myles-Worlsey and Johnston, 1988). The information processing strategies used by radiologists were the subject of a 1989 study by Lesgold, et.al., in which they quantitatively and qualitatively analyzed the verbalized interpretation of selected films according to the methods of text processing and cognitive psychology.
The tension between studies of perception and cognition as it applies to radiographic interpretation is best expressed by Lesgold in the publication of that 1989 study:

Our approach to radiological diagnosis is substantially different from those that primarily emphasize the visual component of this skill, in that we have attempted to directly study the observer's cognitive evaluation of the stimulus and to characterize expert versus novice behaviors in this domain. Recent claims of Kundel and Nodine that radiologists perceive radiographs is a "top-down" fashion, driven by a "visual concept" depart from the more "bottom-up" approaches inherent in feature detection studies and thus are closer to our work, though we do not necessarily agree with their conclusions. . . . We prefer to think of this complex task as being neither primarily top-down nor bottom-up but as a hybrid of the two, incorporating features of both models in a recursive, interactive decision making process. (Lesgold, et.al., in Norman, et.al., 1992, p. S81)

Another interesting line of study in radiographic interpretation involves what can only be called "genetic fitness" for the work - the idea that some people simply can see (meaning detect or discriminate) small details better than others. Using radiographs, content-free images, and standard perception tests such as the standard facial recognition test, these studies have yielded contradictory results and have been challenged on methodological grounds. (Bass and Chiles, 1990; Rackow, et.al., 1987; Berbaum and Platz, 1985; Berbaum and Smoker, 1985; Streiner, 1985)

A number of studies have been conducted to document the effect of increasing experience on accuracy of interpretation. These studies
(Christensen, et.al., 1981; Schreiber, 1963; Herman and Hessel, 1975) conducted solely with graduate physicians ranging from first year residents to practitioners, have shown no effect of experience on diagnostic accuracy - however Lesgold (1989) did show a strong effect of experience in the quality of verbal justifications accompanying interpretations.

The conclusions offered by Norman, Brooks, Coblentz and Babcock (1991) in their review of this body of work is a good statement of the state of the medical literature at this writing:

There is ample confirmation from the review of studies of expertise in visual diagnosis, primarily in radiology, that it differs from our usual conception of the reasoning process of clinicians. There is a large perceptual component, and errors in diagnosis originate as much from this nonanalytic, rapid and largely unconscious component as from the conscious search for individual features and the integration of features into a clinical decision. What is less clear is where the expertise lies. . . . One clear failing of research in this domain is the relative absence of any systematic attempt to understand the characteristics of the task in sufficient detail to link to fundamental processes . . . The educational implications are a little unclear but nevertheless intriguing. If one simply accepts that visual diagnosis does have two identifiable, although not entirely separable, components, it is evident that educational strategies directed at perception and cognition are very different. Perceptual skill is unlikely to be enhanced by any elaboration of rules or high level processing of feature lists or causal mechanisms, although this may well enhance cognitive processing. Rather, perception, with its rapid and gestaltist aspects, is only likely to improve from exposure to many carefully chosen prototypical examples and variations on the same theme. Of course, an alternative espoused by some researchers is to identify individuals who have good general perception from the outset. (Norman, et.al., 1992, p. S82)
Regardless of the specific paradigmatic commitments of any individual study, all of the work published in medicine since 1981 that deals with radiographic interpretation shares a common belief in the ability to speak in a scientific way about the process. Implicit in these studies is the belief that information is encoded in the radiograph in a stable manner, and that the variability in interpretation has knowable, documentable causes that are likewise stable in their individual production and application.

Medical Education/Education literature

There is some literature in medicine and some in education that is firmly connected to common theoretical bases of cognitive science or behaviorism. It is my conjecture that the enormous influx of money for medical education in the 1950's and 1960's brought into medicine a group of educators trained in the prevailing theories of the times - primarily those springing from the research and writings of Robert Gagne (see Gagne, 1970). These behaviorism-motivated ideas in instructional design, and the promises of instructional systems and technology that would be harmonious with medical science became deeply inscribed in those years - so much so that they persist today (Brooks, et.al., 1991; Muzzin, et.al., 1982; Neufeld, et.al, 1981; Pettersson, 1993). "Modernization" of these ideas, by assimilating cognitive psychology investigations in education has influenced the medical education studies of the last decade (Nodine and Kundel, 1985; Norman, et.al., 1989;
The systems approach to pedagogy has led to the production of a wide range of radiologic instruction, both written and classroom. Only two examples of what is a voluminous literature will be quoted here, but in these two examples are both the canonical and the avuncular manifestations of the 'official' approach to learning radiographic interpretation.

The first example is drawn from a 1995 report of a continuing education event in Great Britain. Students at this event were provided with a bank of radiographs that had been prejudged by three radiologists, and they were required to come up with a diagnosis. Their work was then evaluated by the method described below:

During the previous session, as was indicated in an earlier briefing block summary, students had individually reported on 100 images and the next session was dedicated to providing the students with feedback about their performance with this initial image bank. The figures for accuracy, sensitivity and specificity of results had been calculated and would provide a base line against which the progress of the student could be measured during the course (Field-Boden, 1995).

This was the first activity of the course, and underlines the canonical idea that radiograph interpretation can be systematized to the point where
performance of the system can be numerically evaluated. In the next part of this experience, students were inculcated with the objectives of the system, and the acceptable ways of constructing accounts of their work so that those accounts are demonstrably "accurate" and "professional":

The next session of the day consisted of a discussion about report writing in general and activities associated with the writing of radiological reports. There was general agreement that the function of a report could be summarised as follows:

1) To identify the salient features on a radiograph.
2) To differentiate between normal and abnormal appearances.
3) To answer any questions or implied questions raised by the examination requestor.
4) To document answers to questions and information obtained from the examination.
5) To assist directly in the management of the patient referred for the examination.

In general the construction of the report will follow a five stage process:

a) Analyse all the information available prior to constructing the report, this will include the X-ray request form, the patient if available may be able to provide additional information, and finally the examination of the radiographs. It is unusual today for an individual carrying out plain film reporting to examine the patient but the findings from this course of action may well profoundly influence the report or even cause one to extend or reduce the range of the examination.

b) All structures, normal and abnormal, must be positively identified.

c) The features identified should be considered in the light of the presenting evidence.

d) Draw conclusions.

e) Write the report ensuring that specific questions have been answered and in addition comment on unexpected findings and normal variants which may or may not be significant to the clinical questions raised (ibid., 1995).
Troubles have a way of slipping into any system, and even in this rather rigorous system of radiographic interpretation they must be provided for:

Common pitfalls in the preparation of reports on radiographic images are as follows:

a) "Search satisfaction" - the missing of the second abnormality having identified a primary abnormality.
b) "Providing too much information" - by straying away from the clinical question or questions which have been asked the reporter may confuse the recipient of the report.
c) "Too little information" - may occur if the reporter fails to take full account of any associated disease processes such as metastatic bone disease.
d) "Overcalling"
e) "Undercalling"
f) There are widespread difference of opinion as to whether the presence of soft tissue swelling should be commented on in a radiographic or radiological report (ibid., 1995).

Finally, these students are warned against the problems of indexical expressions. This is a passage that we will visit again in this study, because it contains within it an exquisite "insider's repair" to whatever trouble indexical expressions might bring. But for now, this example stands simply as a final set of instructions for the operation and repair of trouble in a system of interpretation:

There has been a certain amount of work done at St James' University Hospital in Leeds in an effort to clarify the various descriptive terms commonly used in radiology such as gross, moderate, minor etc. The use of such terms is fraught with difficulty in that one person's gross may well be another person's moderate and it is extremely difficult if not impossible for a referring clinician to accurately interpret these terms if they
are variably applied by the reporter of the radiographic images (ibid., 1995).

Of a much more avuncular style, but still based on the idea of systematic retrieval of indwelling information, is the textual pedagogy offered over the World Wide Web by Michael L. Richardson, M. D, of the University of Washington:

How can you, a beginning resident, begin to access some of this stuff that you already know, particularly when you are under stress?

One handy tip is: mnemonics. While some people learn lists of facts perfectly well without them, I personally find mnemonics very helpful -- especially the right mnemonics. A good mnemonic radically changes the way you use your brain. Instead of wandering around aimlessly in your head hoping for inspiration, a good mnemonic lets you systematically look one by one in various drawers in your brain, sorting through facts that you already know (Richardson, 1994).

Added to textbook medicine's view of the radiograph as part of an objective world amenable to repeatable description and taxonomic organization is a view of radiographic pedagogy based on repetition:

When I was interviewing for a residency position, a wise old radiologist once told me in graphic detail of a theoretical model that he had constructed of a radiology resident's mind. "Think of a chicken-wire fence." he said. "You then take a bucket full of really runny used chicken food and throw it up against the fence. Most of it runs off, but a little bit sticks and dries. You repeat this process over and over, and you finally end up with a lot of stuff built up there." The approaches in this book are designed to act as that chicken-wire fence in your brain. So, keep reading about musculoskeletal radiology and you'll end up with a lot of stuff built up there (ibid., 1994).
The "stuff built up" in the brains of medical students, at least in the first two to two and a half years, is strongly taxonomic. So, it is no surprise that taxonomy is emphasized in the textual pedagogy of radiologic interpretation:

Richard Moser, former registrar of the AFIP, has said that among the thousands of radiology residents he taught there, there was one major cause for residents blowing unknown tumor cases: they didn't know the names of all of the tumors. This makes sense. If you have never heard of a non-ossifying fibroma, it is unlikely that you will ever put it in your differential diagnosis. If you would cast out the demon, you must first know its name (ibid., 1994).

With these examples the reader is made familiar with the textual basis of the everyday interpretation of radiographs. In fact, there are hundreds of such texts and other instructional materials, but they in general repeat the themes outlined in these brief examples.
Medical Women’s Biographies

Although there is a fair amount of this literature, most of it dismisses the medical school years in a paragraph or two, if that. Many of the autobiographies of women in medicine focus on their struggles to be admitted to the medical curriculum, and their subsequent fight to be allowed to practice, join hospital staffs, and to teach others. In these autobiographies, medical school is simply not an object of interest to the authors.

Women who have written about their medical school experiences have generally not chosen to speak about their learning of radiographic interpretation, instead highlighting moments of patient interaction, unusual settings such as the anatomy laboratory, or conflicts between personal and school commitments. Out of the 30 biographies reviewed for this study, only Perri Klass, in her story of her years at Harvard Medical School entitled *A Not Entirely Benign Procedure*, mentions learning radiographic interpretation:

> And then consider radiology, days in the dark, staring hard, straight ahead, and trying desperately to learn to see; long silences in which you know there’s something going on, if only you could perceive it, and then the discursive soliloquies which also build to controversy, but there’s a rhythm here of set, specific problems posed, answered, and then the story moves on. (Klass. 1994, p.11)

Like most female authors of medical school memoirs, she says very little about the climate for women in the medical school. She does speak of her female mentor, and the “very real lack” of female role models, but the
strongest statement comes in her discussion of the attitude she calls "macho medicine"

I have been talking as if macho medicine is a male preserve, and to a large extent that's true. Certainly there are some female doctors who end up being fairly macho and, much more important, many men who are not macho at all. Some of the gentlest, most reasonable doctors I worked with were male, good teachers and superb healers. But there are also many macho docs, and certainly it is pervasive as a style in the hospital. I don't believe that would be the case if the majority of doctors up to now had been female, and perhaps it will change over time as more women become doctors. The tradition of medical training is partly a tradition of hazing, boot camp, basic training. (Klass, 1994, p.82)

Many biographies of medical women were reviewed for this study, (Baker, 1944; Beshiri, 1969; Chambers, 1958; Clapp, 1974; Fisher, 1919; Haddock, 1985; Hilliard, 1957; Daseltine, 1976; King-Salmon, 1968; Klass, 1994; Lutzker, 1973; Malleson, 1919; McCallum, 1992; McFerran, 1966; Merriam, 1971; Ross, 1949; Sadawi, 1988; Trollope, 1953; Wauchope, 1963; Wilson, 1968; Wilson, 1970) and none of them spoke of the actual, practical, day to day process by which they learned medical information, let alone radiology in particular. Likewise, the most popular biographies of women in veterinary medicine follow the same pattern - except that the veterinary women's biographies are much less likely to mention women's political concerns or struggles for acceptance into the profession. The likely reason for this is that women were not universally admitted to veterinary schools until quite recently, and the books document the lives of women who were admitted after that change.
In Mary Beth Higman Robinson's unpublished doctoral dissertation *The Woman Veterinarian* (1978), some biographical information was collected from the women surveyed. No specific information was collected about their learning methods or experiences relative to visual diagnosis generally or radiography in particular. Also, no information was gathered relative to the classroom or clinic climate for women during their medical education. Some women did, however, comment on issues of women's acceptance in the profession, saying:

"Some clients don't come because I'm a woman"
"Public opinion that women aren't as intelligent and capable"
"Prejudice against women in science in upper ranks"
"Competition for residency: many men are turned off when encountering a professionally aggressive female; unfortunately, a woman needs to be somewhat aggressive or she gets pushed aside by male cohorts."
"Older male members of my profession regard women veterinarians as a joke. Even the older faculty members at college saw it as a joking matter."
"In school I had a few boys in my class who made life miserable for me- the only girl. They were cruel and vulgar."
"Much of what is interesting goes on when 'the boys get together' and if it is impossible to be 'one of the boys' I think you miss a lot." (p. 108-109)

Some sociological studies have reported information from women medical students about the generally "neutering" experience of medical school. In Lopate's *Women in Medicine*, it is reported that female medical students feel "an ambivalence about being thought of as one of the boys... And then consequently as a result of that identification, being thought of as
less of a woman. They expressed vague anxiety about being a member of the third sex" (p. 59). Other women report a fear that their experience in medical school is more than neutering:

The 'culture' of the medical school apparently promotes the hypertrophy of certain (traditionally) male attitudes and behaviors and often is supported by a men's club atmosphere.” (Campbell, 1973, p. 22)

Another medical student says:

"Being a medical student definitely does not enhance one's femininity. I think there is a real threat of being turned into a man. And I don't know exactly what that means, except I'm turned into someone that is driven and compulsive as so many men are, and who doesn't have feelings or hasn't got sensitivity, and who just has no appreciation of beauty in the world. I feel really funny about whether I am dressing too femininely on the wards, and I try to be just as low-keyed as possible about what I am wearing.” (Broadhead, 1983, p. 48-49)

Some crossroads: Medical Images, Feminisms, Epistemologies

Feminist inquiry has, in the main, devoted itself to explicating the patient-physician encounter, the medicalization of the body, and the appropriation of women's health by the male-dominated medical profession. It is unusual to see feminist studies that reach beyond that focus point, about which Paul Atkinson writes:

The clinical consultation has exerted a special fascination not least because of this convergence of formal and political concerns. The analysis of interpersonal communication and negotiation has repeatedly been used to demonstrate
mechanisms of domination and control in operation. The social
distance between the doctor and his or her patient, and the
asymmetrical distribution of expert knowledge and interactional
resources, provide grist for the sociological mill. Sociologists and
discourse analysts have therefore produced a substantial
literature on the consultation. It includes analyses of encounters
wherein social class and gender are shown to amplify social
difference and in turn give rise to interactional processes of
manipulation and exclusion. (Atkinson, 1995, p. 32)

The fact that these encounters, as Atkinson points out, form an easily
observed moment of differential power, has diverted inquiry from the huge
system of interactions among medical persons that supports the entire
enterprise.

Also, feminist inquirers have been drawn to issues, circumstances and
sites which cause the most harm to women, such as those outlined in the
work of Diana Scully, author of Men Who Control Women’s Health: The
Miseducation of Obstetrician Gynecologists (1980).

Emily Martin, in The Woman in the Body (1987), has made inquiry
into the androcentric production of medical teaching images, and has written
about the imposition of the “production metaphor” in medical descriptions
of women’s bodies. She does not, however, as part of her project, describe the
classroom, its interactions, or how the so-called “real” images in medicine
(radiographs, photographs, etc.) are likewise contrived as androcentric.

Feminists such as Donna Haraway (1991a,b,c) have woven compelling
tales of the social genesis of (among other things) medical imaging
technologies, and their role in the construction of new body boundaries,
gender images and world views. Alluquere Rosanne Stone (1995) has likewise probed the far reaches of theory and the meaning of sex and gender in technologized bodies. Due to the scope of this work, only an outline of the political and feminist/political ideologies and theories that relate to medical imaging will be given here, in order to better frame the difference between these writings and the goal of the current work - as well as the hope for the two lines of inquiry to coexist on a continuum of thought about medical representation.

Reflections on the epistemology or social import of medical representation from within professional medicine are almost nonexistent. The editor of the *New England Journal of Medicine* recently reflected on the “imaging genres that physicians encounter in their everyday practice of medicine.” Acknowledging the discomfort of many physicians with new imaging technologies, whose layered abstractions - “representations of representations” - move even further from traditional “hands-on” clinical medicine, (he) argues nonetheless that the promise of improved diagnosis and treatment makes the adoption of imaging systems imperative. (Kassirer, 1992, p.829)

This is not a reflective moment in which “official” medicine stops to ponder the impact of new technologies; it is part of an ongoing concern about “keeping up,” not only individually but as a matter of maintaining the
overall system of medicine, as a debate a year later in the same journal illustrates:

Two papers in the issue of January 7, 1993, on diagnosing aortic dissection describe the difficulties of evaluating the findings of rapidly evolving imaging technologies: among other problems, studies may be incommensurate over time. But researchers responding in subsequent issues, rather than identifying the cultural determinants of this incommensurability, exclusively debate *technique* as the locus of the problem. This shifts the debate about the culture and conventions of medical representation to the merits and deficiencies of specific kinds of technology, and the debate about meaning and interpretation to statistical concepts, for example, the specificity and sensitivity with which a given technique can represent a given property of the body. (Treichler and Cartwright, 1992, p.6)

Although they have provided a clear illustration, Treichler and Cartwright leave one issue unclear in this short quotation. To my reading of these articles (and probably in theirs), there is no "shift," much less a "debate," over culture, conventions, meaning or interpretation among these physicians. A complete explication of the issues of the visual culture of medicine is provided in Lisa Cartwright’s 1995 work *Screening the Body*.

In this section, it will be one goal to showcase some ways of looking at representations in medicine (including those of Treichler and Cartwright) that do not now spontaneously occur within medicine due to the absolute hegemony of the Cartesian world view upon which Western medicine is based. Also, the questions of reality, values and ideology will be somewhat tumbled together, and revealed in the meetings and interstices of the ideas of many writers.
To my reading, some associations occur in the themes and authors about to be discussed: Lyotard's theme tends to be the accumulation and support of power in elites, and Latour explicates the exact features by which representations support power. Finally, though only briefly mentioned, authors doing phenomenological studies of science and medicine bring "news" of how representations are formed and used in everyday practice and disturbing images of what the future of medical representation and pedagogy might be.

The Foucauldian archaeology of medical perception and the feminist critique share a concern about the penetration of the body and the appropriation of the body by others. Though in later works Foucault might take up positions opposite to some feminists' notions of agency, in this earlier work he seems to harmonize well with some strands of feminist thought. A large number of feminist works on medical and scientific representation serve as a pointer to a larger literature; perhaps because of medicine's fascination with the female body (as found in Giuliana Bruno's work), most of the useful work on medical representation has been done by women.

The work of Jean Baudrillard serves to place simulation and virtuality on the table in a symbolic way, and to point out the quicksilver nature of the meanings of representation and reality as well as dystopic visions of the future. Baudrillard (as possibly could be said of Heidegger before him)
occupies a place detached from critique or reinvention of realism, and more in line with some version of transcendental phenomenology.

Finally, Donna Haraway, faithful to her desire for "multiply marked cyborg identities," fills a unique spot in the connection of postmodern, feminist and socialist thought in suggesting that the way out of our troubles might be found by going "way in"; blurring our boundaries by making multiple connections.

Lyotard's report on knowledge

The challenge lay essentially in that photographic and cinematographic processes can accomplish better, faster, and with a circulation a hundred thousand times larger than narrative or pictorial realism the task which academism had assigned to realism: to preserve various consciousnesses from doubt. Industrial photography and cinema will be superior to painting and the novel whenever the objective is to stabilize the referent, to arrange it according to a point of view which endows it with recognizable meaning, to reproduce the syntax and vocabulary which enable the addressee to decipher images and sequences quickly, and so to arrive easily at the consciousness of his own identity as well as the approval which he thereby receives from others - since such structures of images and sequences constitute a communication code among all of them. (Lyotard, 1984, p. 74)

What purposes of medical, or more largely, scientific representation might medical students be exposed to? In The Postmodern Condition, Lyotard (1984) points to one answer which might be called "the protection of authorship." The authority of the scientist and in fact even such an emotional commodity as the esteem and regard of colleagues, all hinge on the
proof of the new finding - the "stabilizing of the referent" in the quotation above.

One's competence is never an accomplished fact. It depends on whether or not the statement proposed is considered by one's peers to be worth discussion in a sequence of argumentation and refutation. The truth of the statement and the competence of its sender are thus subject to the collective approval of a group of persons who are competent on an equal basis. Equals are needed and must be created. (Lyotard, 1984, p.24)

Pedagogy (with visuals to stabilize the referent) creates equals to play the scientific game in the future, while other visuals needed to stabilize the referent (the proposed statement from new research) protect the reputation of the individual.

In this, Lyotard sees the primary difference between narrative representations and scientific ones: narrative knowledge "does not give priority to the question of its own legitimation and . . . it certifies itself in the pragmatics of its own transmission without having recourse to argumentation and proof." (Lyotard, 1984, p.27)

Though sensible enough, especially to those who have been in the room when scientific images have been used in presentation, Lyotard's view of the stabilization of both the referent and the reputation of the author is not enough as a simple lens to view all purposes of medical representation. Specifically, his views only account for a certain "sham royalty" of ideas and persons within a bounded group; they do not account for the more pernicious
effects of medical imaging seen by some feminist authors, or the place of medical images in everyday pedagogy or practice.

**Foucault: the archaeology of medical perception**

Resemblance makes a unique assertion, always the same: This thing, that thing, yet another thing is something else. Similitude multiplies different affirmations, which dance together, tilting and tumbling over one another. (Foucault, 1982, p.46)

Representation, or resemblance, implies for Foucault that there is an original in the world of which the current object is an incomplete copy; similarity does not bear such burdens. The merely similar may be compared to each other, but not to some complete original. Here is where the postmodern notions of dancing, tilting, and tumbling as metaphors for non-linearity, chance juxtaposition and readerly text meet the limits of medical imaging as defined by rationalism. For medicine,

... both resemblance and similitude are inadequate. “Mere” metaphor, similarity, or surface resemblance are to be discounted in favor of “deep,” “genetic,” or “mathematical” reconstructions of a phenomenon’s organization. It is not enough to represent the object; it must be *penetrated* by theory and opened-up to an active manipulation of its principles of organization. (Lynch and Woolgar, 1990, after Edgerton, 1976 and Alpers, 1983)

The “clinical gaze” Foucault delineates in *The Birth of the Clinic* (1973) has this penetration as its organizing principle, and it is a penetration of the gaze, of vision, in preference to any other sense:
The sensorial triangulation indispensable to anatomo-clinical perception remains under the dominant sign of the visible: first, because this multi-sensorial perception is merely a way of anticipating the triumph of the gaze that is represented by the autopsy; and ear and hand are merely temporary, substitute organs until such time as death brings to truth the luminous presence of the visible . . . however, this projection of illness onto the plane of absolute visibility gives medical experience an opaque base beyond which it can no longer go. That which is not on the scale of the gaze falls outside the domain of possible knowledge. (Foucault, 1973, pp. 165-166.)

In these paragraphs may be the explications of the manner in which visuals can “stabilize the referent.” By “penetration” to the “opaque base” beyond which further knowledge is impossible, mere similarity or representation yields to “reconstruction” and “active manipulation.” Medical or scientific visualization becomes the entomologist’s pin; penetrating and fixing the real body of affairs within the protected display case of the discipline.

But, Foucault and Lyotard are speaking of larger themes of power and desire; in their work, we see analyses of the motivation to penetrate, to replicate, to sequence the world and protect the ego - but we do not often see in their work detailed study of the everyday moments in which the penetration, sequencing or replication is taught or learned.

**Haraway : the “god-trick”**

Donna Haraway, who describes herself as “once . . . a proper, US socialist-feminist, white, female, hominid biologist who became a historian of
science . . . (who) has turned into a multiply marked cyborg feminist” (Haraway, 1991, XI), gives us a sense of the impact of scientific visualization and its lack of innocence:

The eyes have been used to signify a perverse capacity - honed to perfection in the history of science tied to militarism, capitalism, colonialism, and male supremacy - to distance the knowing subject from everybody and everything in the interests of unfettered power. The instruments of visualization in multinationalist, postmodernist culture have compounded these meanings of disembodiment. The visualizing technologies are without apparent limit; The eye of any ordinary primate like us can be endlessly enhanced . . . Vision in this technological feast becomes unregulated gluttony; all perspective gives way to endlessly mobile vision, which no longer seems just mythically about the god-trick of seeing everything from nowhere, but to have put the myth into ordinary practice. (ibid., pp.188-189.)

Haraway adds chillingly to Foucault’s notion of penetration the ability to penetrate from a godlike distance and from a position of detached but absolute power. Also, she adds the multiple influences of “militarism, capitalism, colonialism, and male supremacy” to the discussion of scientific visualization, which previously was confined to disciplinary norms, or at the most, the epistemologies of scientists themselves.

Many authors have addressed the politics and values of science, and their commentaries are far too wide-ranging to be summarized here. But feminist analyses have provided unique positions from which to view medical imaging - in that it is often the female body selected for penetration by the clinical gaze - so it is useful to attempt to resound some themes from that perspective, however incomplete. Feminisms have also contributed to
the literature some more embodied, actual moments of the impact of medical visualizations on the daily lives of persons.

**Feminisms confront medical imaging**

For me, as a patient, to know that something was "wrong" was to be acutely aware of my bodily dysfunction and discomfort, and my inability to carry out the most mundane of activities. For the physician, to know that something was "wrong" was to have objective evidence in the form of an abnormal pathology report with respect to the muscle tissue removed from my thigh (Toombs, 1992, p.40).

One of the continuing themes of feminist critique of medical imaging is the appropriation of the "property" (disease) of the individual by the physician, and the taking of the objective, rather than the lived, standpoint in regard to the disease. This distancing (Haraway's "god-trick") shows in many everyday instances - one of which was pointed out by Paula Treichler and Lisa Cartwright in their critique of a medical teaching film entitled Normal Delivery:

At several points during this portion of the film, the voiceover narration illustrates the peculiar way the term visualize is used in medicine: Following expulsion of the placenta, the cervix is visualized ... in repair of the episiotomy, visualization of the apex is necessary for proper placement of the first suture. (University of Washington College of Medicine, 1984) Contrast this agentless techspeak (visualization as an out-of-body experience) with the description of the act of seeing in the feminist health film ("There are many things that we can see, there are many things that we can control") (Treichler and Cartwright, 1994, p.10)
Iris Young provides a view of this process that is more chilling for its pervasiveness;

... the use of instruments provides a means of objectifying the pregnancy and birth that alienates a woman because it negates or devalues her own experience of these processes ... At a phenomenological level the pregnant woman has a unique knowledge of her body processes and the life of the fetus ... Recently invented machines tend to devalue that knowledge. The fetal heart sensor projects the heartbeat of the six-week-old fetus into the room so that all can hear it in the same way. The sonogram is receiving increasing use to follow the course of fetal development. The fetal monitor attached during labor records the intensity and duration of each contraction on white paper; the woman's reports are no longer necessary for charting the progress of her labor. Such instruments transfer some control over the means of observing the pregnancy and birth process from the woman to the medical personnel. The woman's experience of these processes is reduced in value, replaced by more objective means of observation. (Young, 1990, p.170)

Another theme of feminist work is the fascination that medicine has displayed with the female body as the preferential ground for the imaging of both normal structure and disease. Giuliana Bruno cites a comparison of the camera operator and the surgeon, where the "dissecting nature" of medical cinema is claimed, but warns that;

The missing link in this comparison is the dialectics of gender inscribed in such a gaze. On the ashes of anatomy a female body is engraved. Cinema's analytic genealogy descends, in a way, from a distinct anatomic fascination for the woman's body. Such corporeal desire is strongly found instantiated in early cinematic forms, which were obsessed with performing acts upon the body. These acts ... were of a scientific nature for Eadweard Muybridge, who dissected and analyzed bodily motion (Bruno, 1994, p.243).
Objectifying and penetrating have not been the only consequences of medical imaging for women. Treichler and Cartwright make the following problem statement about the wide range of issues involved as they describe the individual works contained in their two edited volumes of the journal Camera Obscura:

...the visual encoding and decoding practices now reshaping the privatized discourses and forms of knowledge through which contemporary medicine, science, and health care inscribe their authority. Documenting a range of current projects in imaging and reinscription, they are concerned with the refiguring of subjectivity and interpretation made possible in the light of new imaging practices. Finally, they assert the fact of agency among patients and providers, activists, technical workers, cultural analysts, and academic researchers. (Treichler and Cartwright, 1994, p. 16)

On a slightly different but complimentary course, anthropologist Emily Martin has mounted a powerful critique of medical images that are not technologically enabled in the way that Treichler and Cartwright discuss. In her book The Woman In The Body Martin focuses on the production metaphor applied to menstruation, childbirth and menopause, and the images evoked by that application - i.e., menstruation as the failure of production, childbirth as production process-to-be-managed, and menopause as the ultimate failure of the production mechanism.

I have explored current medical ideas by focusing on texts that are the basis of teaching in medical schools and handbooks that are guides to practice in hospitals. In addition, I have listened to lectures for premedical and medical students and to many casual conversations with colleagues who are doctors or biological scientists . . . I have tried to keep to the level of the “grammar”
that scientific medicine uses to describe female bodies, and I am confident that the deep level at which such a grammar is formulated and transmitted means its terms are not easily forgotten or dropped. We will see that the consequences of the medical lexicon about women's bodies show up clearly in statistics, such as the rate of caesarian section, and vividly both in women's perceptions about how medicine views their bodies and how women view their own bodies. (Martin, 1987, pp.13-14.)

The view that women's concept (images) of their own bodies is a consequence of the medical lexicon is restated by Allison Jaggar, speaking more generally about the representation of women;

... the standpoint of women is not expressed directly in women's naive and unreflective world view ... women's male-dominated perceptions of reality are distorted both by male-dominant ideology and by the male-dominated structure of everyday life. The standpoint of women, therefore, is not something that can be discovered through a survey of women's existing beliefs and attitudes - although such a survey should identify certain commonalities that might be incorporated eventually into a systematic representation of the world from women's perspective. Instead, the standpoint of women is discovered through a collective process of political and scientific struggle. (Jaggar, 1983, p. 371)

This view of Jaggar's leads me to what Judith Butler has called a "literalizing fantasy," which

... precisely by virtue of its melancholic structure, this literalization of the body conceals its genealogy and offers itself under the category of 'natural fact' ... becoming a gender is a laborious process of becoming naturalized, which requires a differentiation of bodily pleasures and parts on the basis of gendered meanings. (Butler, 1990, p.70)
In this work, however, feminists have more often focused on the impact of medical visuals than on their construction as entities capable of impact. So too, have studies of race and class focused on the "victims" of medical imaging rather than the genesis of those images as social objects.

**Race and class in medical images**

Race and class, as well as gender, are implicated in the ideological domination of medicine and its representations. Ronald Takaki says that:

> Professionalized, medicine in America would become the monopoly of university-trained white men: It would maintain the exclusion of blacks and remove the competition of white women from medical practice. Given the responsibility and power to train and credential a professional elite, universities would institutionalize the reproduction of a stratified class structure in American society based on both race and sex.” (Takaki, 1993, p.207)

Nancy Stepan points out, through her analysis of 'racial difference' studies of the 1800’s, that:

> ... another reason for uncovering or exposing metaphor in science is to prevent ourselves from being used or victimized or captured by metaphors. The victims of the analogical science of human difference were the women and the human groups conceptualized as "lower" races. Their exclusion from the community of scientists doing the analogizing was, to a large extent, part of the same social division of labor that produced scientific theories of natural inferiority. (Stepan, 1993, p.372)

The inclination of medicine to depict disease on the bodies of the marginalized persons of each particular era is a developing theme in the
literature, and centers around the depiction of sexually transmitted diseases.

Perhaps as a response to work on the imaging of AIDS patients (see, for example, *Camera Obscura*, op.cit.), studies of the imaging of sexually transmitted diseases in European history are providing interesting reflections on race, class and gender in medical representation - such as in Sander Gilman's *Disease and Representation: Images of Illness from Madness to AIDS* (Gilman, 1988).

**Holy images**

One final stream of thought on medical representation that arises from feminist critiques is from Sandra Harding - although it is only a corollary of the main stream of her thought (the production of a science that starts its inquiry from women's lives, and conducts investigation in a less partial, less false manner by acknowledging its situatedness), it is a very interesting lens through which to view medical images:

... modern science also incorporates certain authoritarian elements left over from its origins in struggles with religion. It insists on the monologic voice characteristic of totalitarian rulers or of God. It adopts a religious attitude, both toward the "pure nature" it observes and toward its own activities, that rewards fanaticism and the idea of "true believers" who have a pipeline to the one true story about the world. It frequently exhibits a paranoia about the possibility of "outsiders" influencing science, conceptualizing them as "crackpots" and megalomaniacs ... And it conceptualizes scientists ... as chosen people, as elites, as persons morally superior to the "average man" - and, it goes without saying, to women and to "barbarians and savages." (Harding, 1993, p.19)
My work in the history of medical imaging ties directly to this thought, as does the previously cited work of Bruno. The paucity of historical inquiry into the link between religious and medical imaging is a remarkable void in the literature - and though it will not be explicated here, is an interesting place to study how ontology affects the construction of visual learning.

**Latour and the "image assembly line"**

For the purposes of taking an interest in medical image teaching and learning, however, it is necessary to see clearly how such locally produced, taught and learned images can come to have such universally valid effects:

It has been our contention that science should be viewed as politics pursued by other means (Latour, 1983). If politics is about power then, for science, power struggles concern not only negotiations for external resources and internal battles for social and intellectual domination. They have also to do with exerting force to assemble, or disassemble, apparatus, materials, and texts. In other words, they have to do with the actual production of scientific facts. Perhaps it is this that constitutes the defining characteristic of science and which offers an explanation of its power in effecting social transformations. The particular activities in a laboratory, the fitting together of bits and pieces, exert an influence far beyond their local setting because they are linked through chains of equivalence to the large scale and the general. It is in this way that laboratories are able to bend the itineraries followed by others and enrol distant actors in their worlds (Callon, Law and Rip, 1986, p.222)
Many writers feel that this production of scientific fact goes farther than its direct influence on affairs, becoming a hegemonic "filter" that affects all of vision (and, therefore, all of learning and teaching to see):

Vision is socialized, and thereafter deviation from this social construction of visual reality can be measured, and named, variously, as hallucination, misrecognition, or "visual disturbance." Between the subject and the world is inserted the entire sum of discourses which make up visuality, that cultural construct, and make visuality different from vision, the notion of unmediated visual experience. Between retina and world is inserted a screen of signs, a screen consisting of all the multiple discourses on vision built into the social arena. (Bryson, 1988, pp.91-92).

As deep as these thoughts are, they do not seem to give complete purchase for inquiry into what might be called the "ontological curriculum" of medical images; that is, what medical students might be learning about the ultimate utility of medical images. For that last scaffold of utility, the work of Bruno Latour is excellent. Here is his question; how is representation used to mobilize resources to win debates (in the largest sense)? Specifically, what features do representations provide that other tools do not?

For him, representations have to be "mobile . . . immutable, presentable, readable and combinable with one another" (Latour, 1990). Latour believes that the technology of inscribing unchanging texts and pictures, coupled with the ability to reproduce and distribute them widely counts for more than the message itself, as the production of representations becomes sort of an "arms race." With parallel to Haraway, he believes that
anyone who wants to disagree with modern representations must engage in redoubling the "unregulated gluttony" by producing her own surfeit of representations as allies in her cause; as Latour puts it "The cost of disagreeing will increase" (Latour 1990, p.34)

Through reference to Foucault’s exposition of the panopticon, Latour promotes the idea that power is gained through what he calls “optical consistency”; not exactly as Foucault, who saw power as emanating from seeing all at once without being observed, but rather from seeing (or causing all things to be seen) in the same way. He gives the following list of the nine points which make 2-dimensional inscriptions (or representations) so important in the sciences, and which might be looked for as a taught and learned part of the everyday world of the medical student:

1. **Inscriptions are mobile** . . . Chinese, planets, microbes, none of these can move; however, maps, photographic plates, and petri dishes can.

2. **They are immutable** when they move, or at least everything is done to obtain this result.

3. **They are made flat**. There is nothing you can dominate as easily as a flat surface of a few square meters. When someone is said to 'master' a subject . . . you should normally look for the flat surface that enables mastery.

4. **The scale of the inscriptions may be modified at will**, without any change in their internal proportions . . . This trivial change of scale seems innocuous enough, but it is the cause of most of the "superiority" of scientists and engineers": no one else deals with phenomena that can be dominated with the eyes and held by hands, no matter when and where they come from or what their original size.

5. **They can be reproduced and spread at little cost.**
6. Since these inscriptions are mobile, flat, reproducible . . . and of varying scales, **they can be reshuffled and recombined**. Most of what we impute to connections in the mind may be explained by this reshuffling of inscriptions that all have the same 'optical consistency'.

7. One aspect of these recombinations is that it is **possible to superimpose several images** of totally different origins and scales. Most of what we call "structure," "pattern," "theory," and "abstraction" are consequences of these superimpositions. "Thinking is hand-work" as Heidegger said . . .

8. **...the inscription can . . . be made part of a written text.** The text is not simply "illustrated," it carries all there is to see in what it writes about. Through the laboratory, the text and the spectacle of the world end up having the same character.

9. The two-dimensional character of inscriptions allow them to **merge with geometry . . .** space on paper can be made continuous with three-dimensional space. The result is that we can work on paper with rulers and numbers, but still manipulate three-dimensional objects "out there." Better still, because of this optical consistency, everything, no matter where it comes from, can be converted into diagrams and numbers . . .

You cannot measure the sun, but you can measure a photograph of the sun with a ruler. (Latour, 1990, pp.44-46, emphasis in original.)

Lest it be thought that the previous discussions of power and standpoint are missing from Latour's argument, in preference to the details of the exercise of inscription, here is his summary paragraph from the article:

By working on papers alone, on fragile inscriptions that are infinitely less than the things from which they are extracted, it is still possible to dominate all things and all people. What is insignificant for all other cultures becomes the most significant, the only significant aspect of reality. The weakest, by manipulating inscriptions of all sorts obsessively and exclusively, become the strongest. This is the view of power we get at by following this theme of visualization and cognition in all its consequences. If you want to see what draws things together, then look at what **draws things together.** (Latour, 1990, p.60, emphasis in original.)
Baudrillard's dissolution

The French philosopher Jean Baudrillard takes up a position radically different from any we have discussed. In a way, his philosophical nightmare (or literary invention) is the nightmare-come-true of the New England Journal of Medicine editor: a world in which the “representations of representations” have rendered terms like “copy” and “original” meaningless - in favor of a procession of simulacra or images that displace reality.

In Baudrillard’s world, the representations that we were used to, which reflect “reality” are now only a first step in a process whereby they come to mask reality, then mask the absence of reality, and finally conclude with becoming reality.

This can be seen in many forms in medicine, as when the residents are instructed to reposition a patient and make adjustments to the radiographic equipment to “see if we can’t make this radiograph look a little more classic for pneumonia.” In Baudrillard’s words, “the map now precedes the territory.”

It is no longer a question of imitation, nor of reduplication, nor even of parody. It is rather a question of substituting signs of the real for the real itself, that is an operation to deter every real process by its operational double, a metastable, programmatic, perfect descriptive machine which provides all the signs of the real and short-circuits all its vicissitudes. . . . Psychology and medicine stop at this point, before a thereafter undiscoverable truth of the illness. For if any symptom can be “produced,” and can no longer be accepted as a fact of nature, then every illness may be considered as simulatable and simulated, and medicine
loses its meaning since it only knows how to treat “true” illnesses by their objective causes. (Baudrillard, 1991, pp. 442-443)

His work places the issue clearly on the table: how is representation to be thought of? As real, virtually real, resembling, similar, truth, interpretation, or what?

These theoretical studies propose in elegantly crafted language some of the ultimate utilities of scientific images as part of the production of power in the world of science. It could be said that my study intends to follow the production of that power to one of its original sources - not to confirm or deny, but at most to explicate the everyday construction and reproduction of the uses of medical images.

**Feminist Studies of Education and Language, Discourse Analysis**

It would be foolish to attempt to review the massive literature on women and education; moreover, most of it does not contribute directly to this study which involves women who can largely be described as white, middle class, 23-27 years old, and who have completed their bachelor's level education. Few studies exist of classroom interaction and climate for this level of student, and the factors of classroom bias that have been described in K-12 situations have already had and continue to have their effect on these students.
Studies done in higher education, such as *The Lecherous Professor* (Dziech and Wiener, 1984) the AAUW's so called "chilly climate" project (Hall and Sandler, 1982), and others have focused (again) on specific sites and conspicuous problem areas to the exclusion of studies of practical, everyday teaching and learning.

Deborah Tannen (1984, 1985, 1990, 1994a, 1994b) and her colleagues and students have provided analysis of cross-gender discourse, building on pioneering work of the 1970's and 80's (c.f. Lakoff, 1972 and Spender, 1980), and following the traditional analytic program of the field now known as discourse analysis. Again, a realistically full review of this literature is beyond the scope of this work, but several main themes have emerged from this work that should be contrasted with the analysis in this study.

Tannen and her colleagues (as with those who originally did such work in the seventies) believe that they have found regular patterns of language use and conversational behavior based on gender, such as men interrupting women, dominating conversations, etc. (cf. Tannen, 1993). This work claims that these actions are governed by rules, much as sociology might claim that behaviors in society are governed by norms. By this approach to analysis, a stable field is created that allows generalization and "scientifically reliable" study.

In claiming the influence of phenomenology/feminism and associated research methods for the analytic program of this study, I reject the discourse
analyst's notion of rule-governed, stably gender-based interaction in favor of proceeding from actual occurrences in the radiology classroom or study group to a recovery of the methods of those persons and their notions of rules, stability, and gender.

The Sociology of Medicine

It might be thought that sociological studies of medicine would yield valuable observations about the teaching and learning of medicine, but in large part this is not true. Sociological studies of medicine, much like medical autobiographies of women, have not taken medical pedagogy as a topic. The literature on the sociology of medicine is voluminous, and cannot be fully reviewed here. However, the main themes may be mentioned, and representative studies cited, to give the reader some appreciation of how few studies mention the teaching and learning of medicine, and how this study differs from many of those previously published.

There are seven strong themes in the sociology of medicine: the social construction of individual illnesses; power and its manifestations in medicine (feminist criticism might be called a subset of this theme); the organization of medical discourse; patient-doctor interaction; and finally, two lines of study of medical school: as initiation into a culture, or as training for uncertainty.

Studies of power in medical settings include feminist writings (Bruno, 1992; Lock, 1985; Millman, 1976; Scully, 1980, to name just a few) as well as the more general analyses of differential power relationships between doctor and patient (Bartley, 1990; Bloor, 1976a; Bond and Bond, 1986; Clarke and Fujimura, 1992; George and Dundes, 1978; Jeffery, 1979; Johnson, 1972; Lindenbaum and Lock, 1993; Lock and Gordon, 1988; Lupton, 1994; Turner, 1984, 1987, 1992; Waitzkin, 1989, 1991; Wright and Treacher, 1982).


The most famous, if not the first sociological study of a medical school, is *Boys in White* (Becker, et al.) done in 1957. It framed a method of looking at medical students as children being enculturated, and has influenced and continues to influence many studies (see Knaff and Burkett, 1975, Mizrahi, 1984, Shuval, 1980 and Stefan and McManus, 1989). This enculturation theme completely backgrounds the pedagogical interaction of teacher and student in the medical school, and so does not contribute to the current study.

A second famous line of sociological research in medical schools is the work of Renee Fox (1957, 1959, 1974, 1980), first published as a chapter entitled...
"Training for Uncertainty." This theme, of medical students learning to cope with the uncertainties, strange sights and sounds, and new interpersonal interactions that go along with the practice of medicine, likewise influenced many studies (c.f. Bosk, 1979, Bursztajn, et.al., 1990, Gale and Marsden, 1983, and Light, 1979, 1980). Although Fox's studies and those influenced by her work are more ethnographic and less social-scientific than those of and influenced by Becker, they are still uninterested in the everyday practices of medical teaching and learning as a topic.

Phenomenology's contributions

Much of today's inquiry about the everyday world owes an intellectual debt to the phenomenology of Husserl and his student Alfred Schutz. Husserl conceived phenomenology as a descriptive, introspective analysis in depth of all forms of consciousness and immediate experience, focusing on the lived world (lebenswelt) or the inner life (erlebnisse) without assuming the conceptual presuppositions of the natural sciences. His phenomenology proposed to study the intrinsic traits of observable facts and events as they reveal themselves to consciousness. Husserl proposed to suspend, or "bracket," the presuppositions and abstractions (or theories) implicit in the sciences such as "matter of fact," "physical cause/effect relationship," or "material object," rather seeing experience in its purest subjective state and concrete operation (see Husserl, 1931; Schutz, 1962, 1964, 1967, 1970, 1974).
This study will take as an operational principle the phenomenologist’s motto “To the things themselves!”, making the idea of inquiry into the everyday world a central goal without accepting the exploration of consciousness or the “'bracketing'” of Husserl. In making the methods for this study, it will not be necessary to attempt to ignore any part of the world - it will simply be that we will start from the observable world instead of theory, and we will listen to participants’ voices, theories and categories in preference to those of any discipline. In the words of Harvey Sacks,

Our business will be to proceed somewhat differently. We will be using observation as a basis for theorizing. Thus we can start with things that are not currently imaginable, by showing that they happened. We can then come to see that a base for using close looking at the world for theorizing about it is that from close looking at the world we can find things that we could not, by imagination, assert were there. We would not know that they were ‘typical’. Indeed, we might not have noticed that they happen (Sacks, in Atkinson and Heritage, 1984, p.25).

Ethnomethodology’s contribution

Ethnomethodology arose from Harold Garfinkel’s readings in phenomenology, and from his interest in developing an alternative to the rule and norm governed world of the sociology of his mentor, Talcott Parsons. Garfinkel (1952) employed phenomenological bracketing to ask these questions; What would happen if we suspended our belief that people understand each other and share common knowledge of the meaning of the world? What if we took as a policy of inquiry that people demonstrate sense,
meaning, and every other thing in their interaction, all the time? In Garfinkel's words,

'shared agreement' refers to various social methods for accomplishing the member's recognition that something was said-according-to-a-rule (or seen) and not the demonstrable matching of substantive matters. The appropriate image of a common understanding is therefore an operation rather than a common intersection of overlapping acts (Garfinkel, 1967).

This way of inquiry promises the ability to analyze the "building blocks" of sense and meaning, because they are observable at all times in the world, with no "time out." Garfinkel called the everyday world a "technical mystery," and set about specifying a method for its technical analysis. Garfinkel, in summarizing twenty years of work in this line, said:

it is ethnomethodological about these studies that they show for ordinary society's substantive event, in material contents, that, and just how, members concert their activities to produce and exhibit the coherence, cogency, analysis, consistency, order, meaning, reason, methods - which are locally, reflexively accountable orderliness - in and as of their ordinary lives together, in detail. . . . their studies, by composing a current serious situation of inquiry, provide access to a technical domain of organizational phenomena. These phenomena were not suspected until the studies established their existence, provided the methods to study them, and provided what methods and their accompanying issues of relevance, evidence, adequate description, observability, validity, teachability and the rest could be (Garfinkel, 1991, p.17).

For ethnomethodology, and even more so for the submethodology known as conversation analysis, the world is a technical mystery, able to be investigated by technical means; so much so that conversation analysis has been called by some authors a "new positivism." This criticism has led some
ethnomethodologists to claim a "post analytical ethnomethodology,"
concerned with studies of work practices and relying much more on
participant observation than (as previously) on transcribed interaction.

Ethnomethodology has contributed several important things to this
study. First, the insistence on close examination of actual, everyday events;
second, some of the data gathering, transcribing, and analysis of interaction
methods refined by ethnomethodologists; third, the notion of not arriving at
the site of inquiry already in possession of an explanation; and fourth, a
corpus of work (to be summarized next) in the everyday life of classrooms
and medical/scientific workplaces that is thought-provoking and well crafted.

"Disciplinary work practices"

This section will discuss a few ethnomethodological studies of work,
and their application to the study of radiology classrooms. Although
ethnomethodologic studies of the sciences and of classrooms exist, it is
interesting to start a discussion of applicable work with a widely-known (and
on first glance completely inapplicable) study by Harvey Sacks.

"On Police Assessment of Moral Character" (Sacks, 1972) was originally
done by Sacks as student work. In it, he describes the features of special
competence possessed by police in observing the public presentation of
individuals and assessing it as normal or problematic. His characterizations of
"coming to see as a police officer" and being able to use the "normal"
background of the neighborhood as a resource against which to judge
individual aberration point toward similar career paths and methods found
in medicine. Though not as a matter of sociological generalizability, Sacks’
work, as well as the work of others in “unrelated” sites of work (see, for
example, Garfinkel (Ed.), 1986), raises interesting questions with which to
approach data in medical classrooms.

Medical classrooms are classrooms, and a corpus of studies exist on the
production of order and pedagogy in the classroom (see, for example, Heap,
1982; Macbeth, 1987; McHoul, 1978; Robillard and Pack, 1976-86; Sharrock and
Anderson, 1986; et. al.). Classroom studies often highlight that classroom
order is “self-organizing with respect to the intelligible character of its own
appearances” (Garfinkel, 1967). In many of these studies, students and
instructors can be seen "assembling" the lesson from parts (i.e., their own
actions) that are inspected, analyzed and interrogated in concert for deciding
their current suitability and their implication for the course of the next action.
Heritage states that this reflexive action/analysis is most evident when the
normal course of action in classrooms is breached, and is apparent in two
ways:

1. Self-evidently it is the norms of classroom conduct which are,
through the property of double constitution, constitutive in the
actors' awareness of activities which depart from them. The
norms of classroom conduct are thus, inevitably, the vehicles
through which conduct that, for example, challenges or
undermines or ridicules the teacher's role can conceivably be
achieved. The visibility of such conduct is available to all
participants who have an awareness of the norms - and where
their authors can be held to have such awareness, they can thereby by held morally accountable as agents for their actions.

2. The precise character of such departures from the norm is available in detail from an analysis of their contexts - which will necessarily elaborate their sense as actions. And it is through this detailed analysis that departures can be accountably treated as voluntary or involuntary, as constructive or sanctionable, etc. (Heritage, 1987, p.244-245)

Data for these and other ethnomethodologic studies often come from the method now known as conversation analysis, first developed collaboratively in a series of papers by Sacks, Schegloff, and Jefferson. In detailed examination of transcripts of conversation prepared to preserve in detail (within the limits of transcription) the intonation, pausing and phrasing of the talk, as well as its timing, the analyst attempts to recover the displays and methods whereby the parties to the talk understood and conducted the interaction. Schegloff and Sacks outlined their analytic posture in this way:

We have proceeded on the assumption . . . that insofar as the materials we worked with exhibited orderliness, they did so not only to us, indeed not in the first place for us, but for the co-participants who had produced them. If the materials . . . were orderly, they were so because they had been methodologically produced by the members of society for one another (Schegloff and Sacks, 1973, p.290).

In ethnomethodologic inquiry, it is believed that procedures such as observer manipulation of behavior, coding schemes of whatever type, observer vignettes or stories, and, many times, interviews (especially when
interviews are employed instead of observation of the actual work) can all obscure or lose forever the methodological production, in detail, of the collaborative work of the site through the interaction of the participants. Interviewing conducted to record the process of a party-to-the-work forming a "for-the-record" account of the affairs of which he or she is a member would preserve the intent of using the "best evidence" for the ethnomethodologist's work.

A complete technical explanation of the concepts and techniques of conversation analysis is beyond the scope of this discussion, as is even a summary listing of the many studies which rely upon this method for their findings. The reader is referred to several of the founding and defining works in this method (see Sacks, 1972; Sacks, 1984; Sacks and Schegloff, 1979; Schegloff, Jefferson and Sacks, 1977) the most important in the summary sense being Sacks, Schegloff and Jefferson (1974) "A Simplest Systematics for the Organization of Turn-Taking in Conversation."

Ethnomethodologic studies of science and visual learning

It is interesting to look at previous ethnomethodologic studies of the natural sciences, and of the interpretation of images, not for the hope of repeatability such as that prized in many other forms of research; but rather for the validation of the possibility of findings about the local sociology of such work, the generation of questions to take to the new work of observing
the radiology classroom, and "friendly advice" in the conduct of such research.

In the early work of Michael Lynch (1985), "Art and Artifact in Laboratory Science," he studied the "shop talk" among scientists preparing brain sections for electron micrography and analyzing the results. For Lynch, the analytic object was best characterized as "records-under-analysis," where the micrographs became not a picture of real world entities, but a record of the work of the scientists. In a study conducted in 1981, Garfinkel, Lynch and Livingston outlined the work of radioastronomers creating for themselves the observability of a new pulsar in visual data as an interactive achievement located in their talk. Although this study involved expert scientists and not novices like the students in my study, both sets of people are engaged in making an object visible that is not visible at the start of their work.

Note that in all discussions of this sort, ethnomethodologists do not discount the very real accomplishments of natural science, nor do they claim a complete relativism in which such micrographs (or pulsars, or radiographs, etc.) do not have validity. Rather, they take an analytic interest in how that validity is acceptably revealed by the scientists themselves.

Yet another unexplicated resource was identified by Lynch in this study, this one employed by the scientists themselves. He found that the assumption of competence that one scientist held in regard to another was an
essential resource for hearing that person's talk as "sensible scientific shop talk."

One problem in comparing Lynch's study to the study of radiology classrooms lies in the difference between Lynch's competent neurobiologists and the relatively novice status of medical students beginning their instruction. A later work by Lynch and John Law, "Lists, field guides, and the descriptive organization of seeing: Birdwatching as an exemplary observational activity" (Law and Lynch, 1990) is surprisingly applicable to part of this situation.

In this piece, Law and Lynch discuss the difficulty for novices in using "bird guides" - field handbooks with drawings, photographs and textual descriptions of birds that purport to aid in identification. They present the problem of the novice in elaborating a textually ordered piece of taxonomic knowledge in the course of a practical investigation. Their description of how the making of a "bird list" (a description of personally seen birds which is used as evidence of actually having sighted them) organizes seeing in a canonical and normalized form is strongly reminiscent of the advice given to medical students in their reporting of radiographic findings. This study does not give any transcription of the "pedagogy" of birdwatching, where the novice is led to the competent use of bird guides and the shop talk of the hobby.
These two studies form the ends of a scale, of which the radiology classroom is the midpoint. Students of radiology are not exactly novices, in the sense of the birdwatcher, in that they have had many classes in anatomy which form a language base and a visual habit of mind that move them past the novitiate. However, they are not scientists in the sense of Lynch’s neurobiologists; they are not competent to engage in the free and easy shop talk of science by virtue of the unexplicated resource of their competence. At the same time, they are not steeped in the lonely newness of the solitary birdwatcher; they are extremely competent, and capable of engaging in free and easy classroom interaction, in which they have almost twenty years experience.

Conclusions of the Literature Review

Obviously, medicine has interested a wide range of people as a place to study and analyze. It was the purpose of this literature review to place these divergent interests, methods, and epistemologies together, to see what they might contribute to this inquiry into the everyday world of medical teaching and learning.

The results of medical education have drawn critique from feminists, postmodernists, Marxists, and others who see in medicine the operation of class and power differences. These thinkers have not chosen to take up the
everyday details of the transmission of medicine from one set of practitioners to another as a topic for investigation or critique. If their critiques are correct, then it remains to be explained exactly how medicine reproduces these structures of representation and power.

Those with a Cartesian bent have studied medical education, with their commitments to the notion of the improvement of a systematic, stable structure of knowledge transmission and reproduction. In their work, the messy, everyday world of pedagogy is tamed into an experimental site.

Theories, both critical and Cartesian, have been directed at medical education and medicine, but usually without significant reference to everyday practical action, which is the motivating interest of this study. However theories, both feminist and phenomenological, have suggested ways to inquire about the practical pedagogy of medicine that will be taken quite seriously as a guide for the methodology of this study in the next chapter.
I am not a symbolic interactionist, nor a phenomenological sociologist, nor a Marxist sociologist, nor an ethnomethodologist. The sociological strategy I have developed does not belong to or subject itself to the interpretive procedures of any particular school of sociology. It is constrained by the project of creating a way of seeing, from where we actually live, into the powers, processes, and relations that organize and determine the everyday context of that seeing. (Smith, 1987, pg.9)

The one commonality among many of the previously cited studies of teaching and learning medicine is that they have begun from theoretical concepts, and then moved to the site of teaching and learning to find correspondences with or deviations from that theory. Whether dealing with sociological studies, those based on educational psychology, or feminist standpoint works, most have started their activity in the discourse of their disciplines and left the everyday world as a largely unexplicated resource.
This study will proceed in the reverse. Everyday, practical actions on the part of students and teachers are the starting point of this study, which will then follow those actions to the influences that have shaped them outside the everyday world. Although ethnomethodologic studies have been reviewed, this study deliberately both departs from ethnomethodology and conversation analysis, and specifically embraces feminist methods, as outlined briefly in the next sections. Because these embraces and departures speak to the specific methods of this study, they are placed in this chapter rather than the literature review.

**Variation from Ethnomethodologic Methods**

Many researchers have completely rejected ethnomethodology, and even those who acknowledge their intellectual debt to it outline where they depart from what might be called “canonical” ethnomethodology, as Dorothy Smith does in the introduction to her most recent work (Smith, 1991b, pp.9-10). This study must also outline such a departure.

In Smith’s work, the everyday world is a *point d’appui* (point of departure) for inquiry, whereas in the work of many ethnomethodologists it is a point from which there can be no departure whatsoever. In the zeal for studies of practical, everyday action, ethnomethodology rejects any other form of discussion as “theorizing.” Moving from the microsocial to larger social relations is not only outside the program of ethnomethodology, it is
considered irrelevant; according to ethnomethodology, all of the constitutive features of society are to be found in and begin from the demonstrated activities of parties to everyday action. Because of this view, Marxist, feminist and other researchers who believe in some shaping of the everyday world by forces outside the local cannot fully subscribe to the ethnomethodological program, even while finding some of their methods and insights useful. This study will depart from ethnomethodology to view some extralocal forces which shape and determine the everyday, practical action of women learning radiographic interpretation.

A second general point of concern, evident more than thirty years ago, is the way of speaking invented by ethnomethodologists to convey some of their views, as this example shows:

To summarize: it is ethnomethodological about these studies that they show for ordinary society’s substantive event, in material contents, that, and just how, members concert their activities to produce and exhibit the coherence, cogency, analysis, consistency, order, meaning, reason, methods - which are locally, reflexively accountable orderliness - in and as of their ordinary lives together, in detail (Garfinkel, 1991, pg.17).

At best, some commentators have found this and other ways of speaking in ethnomethodology to be a puzzling argot; at worst, this language has been offered as evidence that ethnomethodology constituted a closed “club,” with its own exclusionary language. Furthermore, some of the transcription conventions used in conversation analysis have had the same effect of rendering the data of such studies unrecognizable to the “untrained.”
Because this study’s findings are to be entered back into the world of women medical students and teachers to fuel an ongoing conversation, a specialized technical language would be a hinderance. Therefore, this study will part company with ethnomethodology as regards the manner in which it frames its findings and data.

Finally, there is an issue of validity raised in ethnomethodology, which to some commentators says that the only “true” version of the world is to be found in the ethnomethodologic text - by virtue of its capture of untheorized, undamaged “members’ practices” in the real world. This claims for the ethnomethodologist a form of objectivity that is perilously close to that claimed by natural science, and the ultimate use of such “objective accounts” has been to create the kind of generalizing moves that have earned conversation analysis that label of “new positivism.” This study does not reject other ways of knowing the world, and wishes to use Dorothy Smith’s notion of a point of departure in the everyday world of women learning and teaching medicine - a point to which the produced text will return, and reenter the everyday world in being read and discussed by those teachers and learners.

Affinity with feminist research methods

Donna Haraway recognizes, in her essay The Biopolitics of Postmodern Bodies: Constitutions of Self in Immune System Discourse (1991), both the
difficulty and the "loophole" in representations in medicine. Found within her description of the daunting nature of the problems is a recommendation for close looking at the production of medical ways of looking and knowing by individuals:

The power of biomedical language - with its stunning artefacts, images, architectures, social forms and technologies - for shaping the unequal experience of sickness and death for millions is a social fact deriving from ongoing heterogeneous social processes. The power of biomedicine and biotechnology is constantly reproduced, or it would cease. This power is not a thing fixed and permanent, embedded in plastic and ready to section for microscopic observation by the historian or critic. The cultural and material authority of biomedicine's productions of bodies and selves is more vulnerable, more dynamic, more elusive and more powerful than that. (ibid., p.204)

Following the call for "strong objectivity" made by Sandra Harding, Haraway recommends that

insisting metaphorically on the particularity and embodiment of all vision, and not giving in to the tempting myths of vision as a route to disembodiment and second-birthing, allows us to construct a useable, but not an innocent, doctrine of objectivity (ibid., p. 189.)

In this argument, she recommends that we keep in mind our individual locations and situations, and our responsibility for the production and acknowledgement of representations which are "objective" in the feminist sense through their acknowledged partialness and situatedness.

This study takes as good advice the feminist work that points to medicine as a place that is difficult and complex to gain access to and analyze
with feminist intent, but especially rewarding because of its influence on the lives of women. It also seeks to follow feminist calls for "strong objectivity" and reflexiveness, and for acknowledgement of its limits - particularly that imposed by a man in this society attempting helpful inquiry about the work of women.

Many, many works have been written about "feminist" research methodology, and this study takes as inspiration the many methodologies that have been created, recreated, appropriated or illumined by the feminist researchers represented there (c.f. Harding, 1987; Fonow and Cook, 1991). The specific methods for this study are derived from phenomenology, ethnomethodology and feminism after the work of Dorothy Smith of the Ontario Institute for Studies in Education. We have previously discussed the phenomenological and ethnomethodological strands of this study, which harmonize well with Smith's work, and it is useful now to explore how she sees the feminism in her method of inquiry:

I thought we could have a sociology responding to people's lack of knowledge of how our everyday worlds are hooked into and shaped by social relations, organization, and powers beyond the scope of direct experience. The theorizing of "standpoint" within feminist discourse displaces the practical politics that the notion of "standpoint" originally captured. The concept is moved upstairs, so to speak, and is reduced to a purely discursive function (Smith, 1992).

In this way, she rejects theorizing in the inquiry, but for much different reasons than the ethnomethodologists. Smith's definition of standpoint
differs sharply from other thinkers, both in its definition and its practical effect on method of inquiry:

As I see it, the notion of standpoint works like this: Social scientific inquiry ordinarily begins from a standpoint in text-mediated discourse or organization; it operates to claim a piece of the actual for the relations of ruling of which that discourse or organization is a part; it proceeds from a concept or theory expressing those relations and it operates selectively in assembling observations of the world that are ordered discursively. The standpoint of women proposes a different point d’ appui: it begins one step back before the Cartesian shift that forgets the body. The body isn’t forgotten; hence, the actual site of the body isn’t forgotten . . . Whereas a standpoint beginning in text-mediated discourse begins with the concepts or schema of that discourse and turns toward the actual to find its object, the standpoint of women never leaves the actual. The knowing subject is always located in a particular spatial and temporal site, a particular configuration of the everyday/everynight world (Smith 1992, p.91).

Smith is criticized by some authors for wanting to find an “escape hatch” out of the uncertainty and irony of the postmodern world. Her response is that the discourse of postmodernism is unstable precisely because it is not grounded in actual relations:

The issue, as far as I am concerned, isn’t comfort or tolerance for ambiguity or appreciation of irony. Rather it is an issue of the reliability and accuracy of the products of inquiry, beginning from the standpoint of women. The product I imagine is an explication, and unfolding, of how things are actually being put together, of actual ongoing social organization. I am also increasingly formulating the enterprise of inquiry as a kind of ongoing dialogue with society, with people, in which the inquirer is always exposed to the discipline of the other—sometimes the other’s direct response, but more often how people’s activities are actually coordinated. The language of dominant discourse, to use Collins’s term, is continually displaced and reworked into the process of trying to “get it right.”
It is necessarily destabilized because it is always open to being rewritten as it is disciplined by its engagement with the actual (Smith, 1992, p.93).

Her final statement on method is a clear account of how the product of such inquiry should be judged:

If we are going to do a sociology that serves women, perhaps people in general, it is crucial to get it right. This objective makes no claim to a unitary, absolute or final truth. I’ve used the analogy of a map. We have maps, we use maps, we rely on maps in a perfectly ordinary and mundane way. I’m not aiming for the one truth. I’m aiming rather to produce sociological accounts and analyses that can have this kind of credence: Here is how you get from the Bloor-Bathurst intersection to Ossington on the subway line. The map extends my capability to move about effectively in the city. It does not tell me everything about the subway system in Toronto (its technology, operations, organization), but it does tell me the sequence of stations and gives me some idea of the distance between them. I’d like to develop a sociology that would tie people’s sites of experience and action into accounts of social organization and relations which have that ordinarily reliable kind of faithfulness to “how it works” (Smith, 1992, p. 94).

This methodology, standing as it does in some space between phenomenology, ethnomethodology, and feminist standpoint theory, is guaranteed to offend the purists of each of those viewpoints. Dorothy Smith, in *The Everyday World as Problematic*, expresses the intentional separation of this mode of inquiry from theory:

A sociology for women should not be mistaken for an ideological position that represents women’s oppression as having a determinate character and takes up the analysis of social forms with a view to discovering in them the lineaments of what the ideologist already supposes that she knows. The standpoint of women therefore as I am deploying it here cannot

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be equated with perspective or worldview. It does not universalize a particular experience. It is rather a method that, at the outset of inquiry, creates the space for an absent subject, and an absent experience that is to be filled with the presence and spoken experience of actual women speaking of and in the actualities of their everyday worlds (Smith, 1987, p.107).

Purpose of the study

This study’s methods have taken as a topic the everyday practices of women learning to interpret medical pictures. Additional goals of the study include recognizing/attempting to explicate the positions and voices of the male researcher and the female respondents; being open to the documenting of situations predicted by feminist theory; and fostering the emerging recognition of and inquiry into the topic of their own learning and its multiple contexts of the small cohort of women veterinary students cooperating in the study. Questions guiding the study include, but are not limited to:

Is radiographic interpretation only one enterprise?

What are the uses of a radiograph to those engaged in its interpretation?

How do teachers/students construct accounts of the process of learning and teaching interpretation? How do they describe their conduct with reference to rules, norms, values, etc.?

What are the observed differences between novice and expert interpretation? Between instructed, group assisted and solitary interpretation?
How do novices make the "instructions" useful in their reading of radiographs?

How have previous studies failed to describe the actual teaching/learning/practice of radiographic interpretation?

Do gender issues explicitly surface in members’ accounts or actions in the learning and teaching situation? Is women’s experience ever an explicated resource in this interaction?

How is the correspondence between radiographically visualized structures and textbook anatomy taught and learned?

Conduct of the research

Female veterinary students and female teachers of veterinary medicine were the respondents in the interview portion of the study, which was conducted over a period of approximately six months. All women were chosen for the interview segments, because of the study’s focus on women’s experience of medical visual pedagogy. The group study sessions documented at times included male students.

An attempt was made to recruit into the study women with varying backgrounds and (in the case of students) different levels of proficiency in veterinary medicine; some just entering, and attempting to correlate structures and their images, and some beginning their clinical years - attempting to correlate images with disease. It is the intent, in this descriptive and phenomenological study, to get as much diversity of background in this sample as possible. The disclosure to all prospective respondents of the analytic interests of the researcher could have yielded respondents with
similar world views; this was not seen as a weakness in the study. How the respondents in the study actually came to enter the study was documented, and has become part of the findings.

Achieving diversity in the sample was not an easy process. The selection of candidates for veterinary medicine is an intensive sorting process that begins possibly with girls in junior high school. Whites predominate, and the student body is shaped by the economic demands of a veterinary education that is largely unsupported by scholarship money.

This study was conducted over the months of November 1995-February 1996. Interviews were audio tape recorded and transcribed with both female students and faculty, and approximately 10 hours of classroom or small group interaction in the reading of radiographs was audio taped and transcribed for analysis. Because of the use of simple observation and interview without experimental intervention, and due to the anonymity afforded all participants, a waiver was granted from Human Studies for this project.

The standard social and behavioral sciences consent form was signed by participants in the interview process, and participants were given the opportunity to review transcripts used for publication and withdraw their permission for use if they so desired.
This study:

- Used researcher as instrument
- Used researcher's 22 years experience as analytic resource
- Gained its' entree' through researcher's involvement
- Rejects theory-driven inquiries such as listed in literature review
- Rejects experimental designs common in medical education
- Uses 'unsystematic naturalistic observation'
- Picked participants through "sampling" which is purposive in the extreme
- Was shaped and reshaped during the inquiry by the collected data
- Seeks to be harmonious with feminist inquiry
- After Harding, intentionally seeks to describe women's experiences, not men's
- After Smith, seeks to present the corpus of data for the evaluation of all, to demonstrate respect for all participants by retaining their voices, and will trace extralocal influences on the everyday world of teachers and learners
- Is microethnographic
- Uses some of ethnomethodology's research methods
- Does not commit to all of the phenomenologic bracketing enterprise
- Remains informed by feminist literature
- Remains hopeful of the generation of consequential findings
- Interviewed both women students and instructors
- Observed and recorded small group interactions between novice interpreters
- Sought reflexive commentary by participants on its analyses
- Looked at materials and environments consequential to the participants

Presentation of Data: Transcription Conventions

The transcription conventions of conversation analysis (considered to be a subset of ethnomethodology) were put forward by Sacks, Schegloff and Jefferson in their work "A Simplest Systematics for the Organization of Turn-Taking For Conversation" (1974). In addition to the use of symbols, they advocated the modification of spelling to attempt to convey the actual sound of the talk being transcribed.

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we have simply tried to get as much of the actual sound as possible into our transcripts, while still making them accessible to linguistically unsophisticated readers.

In this study, I have dispensed with these transcription conventions in many places, in order to make the material more accessible to the reader. However, in some places a few of the transcription symbols are used, and the following guide may be helpful to those unfamiliar with them:

( ) Single parentheses indicate that transcriber was not sure of the word.

(data) Words in parentheses are the best guess of the transcriber.

/ / Indicates that one speaker is overlapped by another.

[ Brackets indicate speakers starting simultaneously.

(0.5) Numbers in parentheses indicate pauses, in seconds.

kay . . . whyncha tellus Transcriber indicating a casual, run-together version of "O.K., why don't you tell us"

pointitoutome Transcriber simulating words run together "point it out to me"

Analysis of Data

The work of Dorothy Smith, as previously discussed, blends a microsociological inquiry which is the starting place with an analysis of texts, environments and influences which shape those local sites according to the desires of those in power. By its nature, such a method requires two rather separate readings of data - the first, rather technical and detailed, amenable to
many of the techniques of ethnomethodology, and the second, more political and epistemological. Here's a brief example of such a "double reading," based on a recorded and transcribed moment in a radiology classroom. In the transcript, T is the teacher, an African American male, and S is a white female student. The numbers in parentheses give the approximate length of the pauses in the talk, and ellipses within parentheses indicate words that could not be heard on the tape.

T: Ok, whose gonna talktame about this?
   (11.0)
   Don't be shy! We're among friends! (1.0)
S: um..th cranial mediastinum is (1.0) has a soft tissue (1.0)
   um (1.0) radiopaque (1.0) um (1.0) mass..um
   (2.0)
duh
   (4.0)
lungs seem to have a mild interstitial pattern
   (3.0)
   um
   (4.0)
cardiac shadow seems to be obscured
   (3.0)
   um
   (laugh)
   (9.0)
   trachea doesn't seem to be elevated
   (6.0)
   the heart seems enlarged on this view, but I guess it (.....)
   soft tissue density (.....)
   (4.0)
T: whats that border n whats that border?
First Reading, Technical

For those familiar with ethnomethodologic studies of the classroom, there are several familiar noticings in this transcript. The call by the teacher for self-nomination of a respondent, and the answering of that call is an enduring feature of classroom discourse (see previous cites). Next, to my hearing, the student provides a series of candidate answers in the form of canonical phrasings of the description of individual organs on the radiograph. As other workers have pointed out, the lack of teacher response to each of these can be heard as a negative evaluation - and as the transcript proceeds, the student's pauses lengthen as she searches for more candidate answers. My reading of the laugh (followed by a nine second pause by the student) is that the cohort is carefully following the same indications - knows that the student is in trouble, and is reacting in sympathy. The teacher finally ends the implicit question posed at the beginning of the transcript (where's the feature of interest?) and begins a new question sequence by pointing out that area (answering the first question) and formulating a new question requiring new candidate answers.

In this first piece of transcript, the subject matter of the classroom is of no consequence in explicating the resources that produced it. In the literature of classroom interaction, this same pattern is expertly produced by fourth graders in the same manner that we see it here produced by "eighteenth graders."
Second Reading, Extralocal relations

As demonstrated in the work of Dorothy Smith, participant observation starting from the standpoint of women can help identify organizing influences outside the site of research that shape the interaction there - beyond the technical organization of the interaction explicated by ethnomethodological technique. In this case, the "canonical phrasings" provided by the student as labels for her observation tie this classroom moment to the larger project of creating accounts of radiographic interpretation that are suitable to the managed organization of a large hospital.

When a radiograph is interpreted (or indeed, any sort of medical action is taken) it is made necessary by the bureaucratic, legal and financial organization of even a private practice of medicine that an account be entered into a record of this action. Billing of charges and defense against lawsuit are only a few of the uses of such records. Their production by typists is expensive, and their nature must be constrained to the future bureaucratic purposes for which they may be needed - therefore, the pattern of their construction and the nature of their language is predetermined; it is part of the work of "learning radiology" to learn to produce such accounts for the overarching bureaucracy. As respondents to this study have told me, such
accounts have no use for the clinician, who makes her decision and takes her action long before the official account is produced.

Summary

This study's epistemology is phenomenological and feminist; its methodology is that delineated by Dorothy Smith; its research methods are, in part, ethnomethodological, ethnographic, and participant observation (this use of epistemology, methodology and research methods is borrowed from a discussion by Harding, 1987, pg. 2-3). The analysis of the data will be provided in two readings: one technical and local, showing how these women organize the accounts or interactions of the everyday world to produce the good sense of their teaching and learning; one political and extralocal, showing how forces outside the classroom and radiology reading room attempt to organize the daily world of these women. The data itself, as previously mentioned, is in two parts; interviews about radiology teaching and learning, and transcriptions of small group learning exercises in the radiology reading room.
Chapter 4

A Study of Novice Radiologists and their Teachers

The Ohio State University College of Veterinary Medicine is one of the oldest and largest veterinary schools in the world. Like all veterinary schools, it has experienced a profound shift in enrollment over the past 10-12 years, going from classes containing only one or two women to classes that are over 70% female. The students admitted to veterinary school are among the most proficient of undergraduates; most have kept GPA’s of over 3.5, while taking difficult prerequisites such as biochemistry and genetics. They will spend approximately 90 hours per week for four years learning veterinary medicine, and will accumulate a debt of about $100,000. Most of these graduate veterinarians will go on to private practice, where they will be paid a starting salary of about $30,000.

I have worked at this research site for over 20 years, first as a medical photography technician, then as a producer of medical television tapes, and
now as an instructional designer and faculty developer. From that long association, I have a relative insider’s knowledge of some aspects of veterinary medicine and certainly an inside knowledge of the operation of the College.

Problems of the field

In contemplating this study, I counted on my insider status to relieve the often related problems of access and trust. I believed that as I was known to students and teachers, it would be easy to get free access and that I would get “better” data than someone coming in from outside the organization.

The first challenge to this thinking came when soliciting student participation in the first round of recording group study sessions with radiographs. I placed a letter in the mailboxes of over 130 second year students, just prior to the scheduled beginning of their group sessions.

Much to my surprise and puzzlement, this letter drew absolutely no response from the students. Initially, I was too hurt/angry to explore other options, or to make more than a cursory inquiry into why this letter drew no response. What inquiries I did make were answered with versions of “I was real busy, and I just put it up for later” and “I thought you’d get enough without me.” My “correction” for this lack of response was to solicit the first year class, which is generally considered within veterinary schools to be more compliant with any request or procedure, particularly if it involves some
clinical or pseudo-clinical dimension that might tend to relieve the boredom of class and lab work and give a foretaste of the "real" medicine of the third and fourth year. I thought up a scenario that might generate some interesting interaction from these students (who are relatively unacquainted with radiographs at this stage in their learning) and sent a letter to every member of the class - once more, this letter got absolutely no response. Even given the fact that many of the students were leaving after exams, I thought that at least a handful would have volunteered to participate. What few students I spoke to about this letter gave largely the same response as the second year students when asked about their lack of response.

I am not sure, to this day, what to make of this abortive first attempt to recruit students for the study. I can only say with certainty what did work, and allow the reader to draw what conclusions they like. After these two letters, I began to solicit personally individual students who were known to me through social contact, through their activities as work study students in our learning lab, or through other casual encounters. I would explain to them what I was doing, that their peers and their instructors would never know who was involved in the study, and that I was trying to find out the practical steps involved in going from novice to expert in the reading of radiographs - not to judge the quality of their work, or the "rightness" of their answers, but simply to get their efforts described for others to read about. I asked these individual students to speak to others in their study group at a time when I
was not present, to see if any of the group objected to being part of the effort; and if anyone did, to not pursue the matter further. In soliciting study participation in this way, I had only one non-participant out of contact with several dozen groups of 4-6 students, and that one may have been a miscommunication.

In attempting to record accounts from individual teachers and students in an interview setting, some interesting things happened. Faculty who were solicited to speak “on the record” about how radiographic instruction is done always immediately accepted the invitation, and dismissed in some manner the offer of anonymity. They never objected to being tape recorded, and (to my observation) seemed to answer the questions put to them quickly and confidently. Students who were solicited to speak about their experiences agreed quite readily, although a significant number said things like “Well, I’m not really that good at it” (meaning radiographic interpretation) in the course of the discussion leading up to making arrangements for the interview. A few students expressed a general discomfort at being tape recorded, although all but two ultimately made the decision to allow recording after hearing that it was solely a transcription convenience and not to be publicly played.

Observation and participation

Intensively, over the course of six months, I went to class with veterinary students learning to read radiographs. There were only two venues where
this teaching and learning occurred; in the large main lecture hall of the
Teaching Hospital, where 45 minute lectures with two slides at a time on the
screen were the norm, or in small groups of 4-6 students clustered around a
bank of wall-mounted light boxes that would hold about four radiographs at a
time.

For the most part, in this observational phase of the study, I did not tape
record. Once I was known by the students, and had participated in many of
their classes, I was readily invited to record other sessions at which I was not
present.

One of the most interesting observations in this phase was the physical part
of radiology interpretation—something that is not mentioned in years’ worth
of literature. First, I noticed that the light boxes are almost always mounted
on the wall, and upon further investigation I found that they are always
mounted at the same height; the average eye level of men, which is about
four to 4.5 inches higher than the average eye level of women. For some
students, this height caused an uncomfortable situation over the hours spent
viewing radiographs. I noticed that it was quite uncommon for any of the
participants in the group study session to make eye contact with each other.
Every person in the group went from glances at the notebooks in their laps to
a fixed staring at the radiographs on the viewers. It is, for the observer, a
stunning, trance-like stare that is quite distinctive, and it is catching: I found
myself doing it after a few weeks.
Physically handling the radiographs is part of the learning, and is somewhat of a milestone in the progress of a student. In their first year anatomy labs, someone else places the films on the viewers in their proper orientations, and this procedure lasts through some of the laboratories of the second year. When students are finally given the distinctive yellow envelopes full of radiographs, there is a physical learning how to handle, separate, and properly place them on the viewer that is quite noticeable.

At about this time, some students begin to pick up on physical features of the films themselves as a clue to the accomplishment of classwork. For example, if there are three films in an envelope, and one of those films is more worn and damaged than the others, it is common for students to assume (quite rightly!) that it is the film most likely to lead them to the "right answer." Likewise, an old medical students' trick is to hold the radiograph so that light bounces off its surface rather than through it. In this way, you can see the marks left by the finger oils of previous viewers - which often cluster in the area which shows the irregularity to be described by the student. (This works even better for students during their later clinical years, since usually only two persons will have previously handled the film - the expert clinician in charge of the case and her resident).

It seems also that those who are positioned within "pointing distance" of the radiographs have a better chance to participate in the discussion than
those who are not. Rarely does someone "out of pointing distance" make the effort required to thus emphasize a point.

Although the radiology texts almost uniformly advocate "a quiet, darkened room" as the site for interpretation, the students that I observed almost never had this arrangement. Laboratory sessions where groups look at radiographs are incredibly noisy - with essentially 65 people talking at once in close proximity. Sometimes these laboratory rooms were darkened, and sometimes they were not, depending upon the instructor. When students got together outside of class time in their personal or assigned study groups, they most often chose a brightly lit, partitioned off space within a student media laboratory. Though quieter than the 65 person laboratory, it still would not be described as the "quiet room" of the radiology textbook.

One of the most interesting observations of the study concerns the so-called "hot light"; this is a strong light bulb enclosed in a metal housing and equipped with a foot switch to turn it on and off. It is used by expert radiologists to see better in areas of the radiograph that are dark but still contain details. The example that I was shown by a radiologist is that the bones of a leg can be seen quite well on a normal lightbox, but with the aid of the hot light the outlines of the tissues around the bone can suddenly be seen.

None of the student laboratories is equipped with these hot lights, and none of the areas used for group viewing is so equipped. I never saw any student attempt to simulate the hot light by holding a radiograph closer to a light
source, and I never saw any student block off the stray light coming from the sides of a film in order to get a better view of dark areas (a procedure that is at least mentioned in text and lecture).

Radiology teachers that I asked about this were quite surprised, as if they had never thought about the fact that students did not have access to a hot light, nor encouragement to use it. They did say that the hot light was commonly used on films that are overexposed or overdeveloped, a situation that presumably does not occur often with hand-picked teaching films, but they did say that the use of the hot light would still be a part of viewing normal films. Students I talked to couldn’t remember ever having been told how to use the hot light, and said “they don’t let us play with all the toys . . . It’s enough if we can tell them where the bones are.”

Laboratories

Student laboratories in radiology are usually set up as stations around the periphery of a large room, since most radiograph viewers are wall mounted. In the case of the laboratories in this study, a large room used for practice surgery is used, and there are about ten banks of viewers around the room’s edge, each capable of holding about four radiographs side-by-side. When students come into this room, they place their belongings on the floor around the edge of the room, find their group-mates, and pick a station to begin with. Without consultation or prior admonition, the groups readily find the next
empty station, and change stations with fairly equal timing - and always by moving to the group's right!

The instructors for the laboratories either stand in the middle of the room, often talking to one another, until summoned by a group of students, or they move from group to group listening in on the discussion and offering comments. In most of the laboratories I attended, a mix of both actions was usual.

It is interesting to think about how the instructor picks groups to help. In some cases, especially in laboratories earlier in the curriculum, the instructor can see from across the room that the films are on the viewers in the wrong anatomical position. At other times, the instructor is specifically summoned by the group to answer a question. (What happens when the instructor is summoned is the subject of some transcript in one of the next sections).

Lastly, the instructor may go from group to group listening in on their 'deliberations', looking for evidence that his or her help is needed though the students do not recognize the need. It is interesting to think about how exactly an instructor hears the competence or incompetence of the talk in a small sample of an ongoing conversation, and how, conversely, students might try to display competence to be so read by their instructor.
Small group study of radiographs

After a course of lectures and laboratory sessions such as those described above, students are assigned to go in groups of four or five for practice in radiographic interpretation. There is no instructor present or available during these sessions. The students are given 50 sets of radiographs in individual envelopes, each with a set of two index cards; the first containing a brief history of the animal's symptoms and the second containing a formal report of the radiographic findings as the radiologist might have dictated them into the official record. In addition to the 50 "disease" films, the students are given a package of films containing "artifacts"; processing errors, bad pieces of film, stray metal parts that somehow got under a dog being x-rayed and thus showed up on the films by accident, and other things that are not to be interpreted as "real disease." The transcripted student interaction in the latter section of this chapter is largely drawn from these small group sessions.

The first order of business for these groups is the picking of a "reader of the cards," and picking someone to write down the group's interpretation of the films. Often, the reader is also the person who physically puts the films up on the viewers - a demanding task for beginners, since much of the confusion at the outset of learning radiology is in deciding what you are actually looking at and from what direction. The task of writing down findings is equally demanding, since it forces the writer to reconcile a lot of talk and often quite differing opinions into some sort of "account" of the findings of the group
that will be acceptable to all. In all of my observations, these tasks were passed around in a strict rotation - whose turn it was for each of these jobs was often the very first talk “on task” of the meeting.

Students seemed to have the same fixed stare toward the films that was evidenced in the laboratory session, although generally they are more relaxed in body position (probably due to the nicer chairs in the student instructional lab). They generally worked for about two hours at a time, looking at 15-20 sets of films in that time.

**Gender Relations Observed**

Going into this study, I thought that there would be many, many instances observed and tape recorded of gender-based comments, conflict, or male domination of the interaction. Against both the expectations and the beliefs of the researcher, it was quite uncommon to find such events in observation or upon examining recordings.

Many of the study groups were all female, as would be expected in the random assignment of a class which is 73% female. In the groups containing men, I could not observe significant events that I could relate to gender. Some of the female respondents to the study said that they wondered if the men were intimidated in mostly female groups, but I could not find observational or interview evidence to support that speculation. Although some transcript will be discussed where these issues might be identified, this part of the study
certainly did not yield easily identifiable data about issues of gender and their impact on the education of these women.

Influences on the Interviews

All but one of the interviews were held in my office in the veterinary hospital, which is the educational center for the College. Although some attempt was made (by rearranging chairs, using a microphone that was not prominently displayed, etc.) to make the situation less formal, it was still quite certain that these interviews were being done in an official place, among people who had in part an official relationship to each other. The interviewees assumed, quite rightly, that I had a good working knowledge of veterinary medicine and veterinary education, and that I was generating a professional educator's account of their teaching and learning practices for submission to highly qualified professors of education. These interviewees knew that I had a special interest in the educational experiences of women, and that I had an academic background in feminism. What follows in the first large section of the study, that of the collected accounts of students and teachers, is not the "truth" of radiologic pedagogy; it is a collection of the accounts crafted to be competent and faithful to the practical affairs of medical student and teacher, as well as answers to my questions, as I framed them and as the situation framed them, by people who are competent practitioners of the affairs of radiographic teaching and learning. Those answers are intially
arranged here in categories that arose from the answers themselves, with full knowledge that such arrangement imposes a degree of categorization which the affairs themselves almost certainly do not reflect.

Teachers speaking about radiologic pedagogy

One of my own questions about radiographs goes back to the introduction to this study; why is the public fascinated with radiography? Why has the x-ray become such an iconic representation of medicine? Out of my own curiosity, and somewhat as an icebreaker, I asked a number of the faculty their opinion.

Don’t you think of an x-ray when you think of a hospital? And maybe it’s because it is one of the first things that let us actually have a glimpse of, or a different perception of it, like being up in a plane and looking down?

I don’t pretend to know the answer, but I’ll throw out the first thing that comes into my head. It is a hard copy representation of how the doctor sees the inside of the patient. Meaning, that’s what we’re supposed to do... as doctors... is be able to see the insides. I mean looking at lab data, which is to look at the inside, doing a thorough physical exam, doing a good rectal exam, all of these things are to achieve that same thing, but they don’t have nice, pretty hard copy to go with it.

Some remember their initial introduction to radiographic interpretation as veterinary students having a sense of excitement, or a sense of initiation into an area of special knowledge or secrets:

I remember thinking that they were pretty cool, I mean, you thought that you were a doctor you know, really you did, you were so naive, and you’re like “Oooooh! That’s a radiograph, you know?”. "I’m reading a radiograph!" So I remember that. Somewhat enchanted by it, you know?

Yes. I don’t remember exactly in the curriculum when we were taught how to look at the radiographs, and figure out what was wrong with
them. I remember learning real normal situations, but I don't remember when the pathology side came in until Senior year.

One thing that all faculty seem to agree on is the importance of learning what to focus on and what not to focus on when looking at the film. Many of their comments identified this as the primary learning problem for students:

The big problem is that they perceive a lot of light coming through from the viewer that strikes their eyes and they bounce around and they don't really know what to zero in on or how to organize their thoughts. You could ask them to look at a film and tell you what they see and they might say they see a heart and they see the spine . . . they see things that bounce to the retina which are mostly light transmitted areas. The animal has a gunshot wound, they'll see the pellet. They'll see the bullets, they'll see a plate on the leg; they see the bright things first. They bounce around over the film.

I think that most people have tunnel vision, and that to be really good film readers to get the whole picture, (1) They can't focus on things too early, in fact if you are going to pick an area that you think is the problem, wait until the end to look at it, which is probably the most important thing that I do, that I suggest that people do, and (2) develop a usable systematic approach to looking at radiographs. Now that is probably no different than anyone else, but it's probably different for every person.

Avoiding premature focusing-in is a recurring topic among faculty, and is one of the chief admonitions of textual materials about learning radiographic interpretation. The suggested "cure" in radiology texts is the development of a systematic method of looking at all areas of the radiograph - as reiterated by the faculty in this study:

Yes. There is a system. You have to have a system. But your system can be totally haphazard to everybody else. You don't have to use the S, you don't have to use the Z, you don't have to use the concentric circles, . . . I tell the students this all of the
time. I don’t care what your system is, . . . just have a system, and use it.

I can only tell you how I made that transition from understanding what normal is and then finally figuring out how to understand what the abnormal situation is from there. I think that I learned it by looking at a lot of radiographs first, . . . of normals.

Sometimes, respondents would identify specific breakdowns of the “system”:

Listen to this, this is important. When I talk to the students up in the Senior clinics, in my ward, . . . “How were you guys taught?” .....They look at radiographs and get your diagnosis, . . . “well, we go through systems.” .....is what I usually hear. You know “We’ll look at the urinogenital and digest it, then we look at separate organs and this and that,” but they haven’t gone through an actual approach to what they should do with the abdominal film and the thoracic film and a limb . . . Do you know what they’ve missed? They miss the outside . . . they miss the junction between air outside the body and the skin, are there any bumps there, swelling . . . they missed that! Because they don’t see that as an important thing. You look at a limb, you look at the bone, everything else, . . . but, . . . the soft tissue is barely seen, if you don’t look close, you don’t see that there is a bump there. They miss it.

The notion of “normal” is a particularly interesting place to look at the teaching and learning of radiology. Thinking about the measurements used by the scientists in Michael Lynch’s study, the assessments made of “normal heart size” or “normal appearing lungs” have an indefiniteness to me and a definiteness to doctors that is interesting to explore - so almost all of the faculty respondents were asked about how they teach/were taught to
recognize the appearance of "normal," in this case with reference to the image of the heart of the dog:

they did give us numbers, you know, they said three to five intercostal spaces for the length, and I remember counting that when I started, so I guess initially I did somewhat use measurement to have a feel for it, but it is a hard thing to communicate, but it left, and you just start knowing what normal is. And I know, that's frustrating. I wish that I could help you. I will say that when I do it with the students, and they read heart size, I tell them that the first thing that they should decide, is it normal, too big or too small? Most of them can actually do that, but what they really have a hard time with is if it is too big, I say is it mildly big, moderately big or severely big? We almost never agree on that one.

There are standards, . . . for example a heart, . . . it should be three costal spaces wide, it should be at a sloping angle to the trachea, should not be too much sternal contact, so those are standard things. There are things that we have incorporated that say that these are within the normal range, however that sometimes lulls us into a sense of false security. So, we look at things, and we say that this is within the normal range and if we do not also say to ourselves, but not every animal is going to show the abnormal appearances, . . . we will miss a lot of things. I think, from my experience, 10 to 25 of abnormal cases show up as normal.

Students learning to read radiographs in their second and third year courses have had a full year of work in anatomy covering dogs, cats, horses and food animals that included dissection and lecture work. During the laboratory periods, some radiographs of the areas under dissection are put up on light boxes around the periphery of the room. Faculty respondents to this study emphasized the importance of anatomy to their practice of radiology, and
often expressed dismay that the student’s experience in these courses had not “taken” to a larger degree:

I make sure that they all can read, like where the normal anatomic structures are, so I make them point out where each chamber is on the radiograph of the heart, where the vessels are. . . actually anatomically identify everything, which amazingly sometimes the seniors, they still can’t do. But that way they can usually if you go over it, then they can. So, they could at some point, but it is not fresh in their minds, you know, they can’t really use it well, so I will have them go over that. And then I go over what the classic, . . . I mean I guess it is sort of pattern reading . . . What the classic abnormal patterns are, Like what happens to the heart on both views if this chamber gets big. Well, you get a bulge here and you get a bulge here. What happens if this chamber gets big, you get a bulge here and you get a bulge here. You kind of go through all of the abnormal patterns. Same thing for vessels, same things for lungs . . .

Some of the students don’t know the anatomy at all. and you put it up there, and they’re struggling to tell you that it’s a hock joint. or they’re struggling to tell you even “the carpus.” And they’re trying to find bones and they can’t remember the names of any of them. So those people are at a disadvantage, than the student that does know the anatomy and as soon as you put it up there does recognize it as the carpus, could name you all the bones, well that person may just be more studied. It may not be a natural talent. But it puts them a stepping stone ahead in reading films.

One of the recurring themes in the literature of radiology education was the notion of how and when students become able to think about the three dimensional situation that is represented by the two dimensional radiograph. I asked each of these teachers about this issue of teaching students dimensionality in the radiograph:
I think that two key things help with that. One is to bring out a specimen. That, to me, has been the most helpful thing. And we did it just today. You go get the bone, an actual model of it, and you show them “look, here it is.” Now tilt it and look at it as 2D and tell me what you see and they go “my God, its the same thing as the radiograph.” And so sometimes, for the first time, they’re able to take a 3D to a 2D. I almost think that is harder than taking a 2D to a 3D.

“OK, I’m going to bend my leg, and pretend I’m shooting a beam from here to here (demonstrating on her own leg) and now I’m going to pretend I’m standing here and looking at it as a two dimension. And then they can tell that “oh yeah, look at that, its gonna highlight the front right here, and then coming from a lateral view...” and so I teach them to go from the specimen that looks exactly like what they’re looking at to some known fixture body part that will always be with them - so whether they’re looking at a carpus, or they’re looking at a hock, or whatever, that they can then convert that to their own joint and then use that in thinking about it... how, how it would appear as a two dimension.

This discussion often led into a subject that I heard a surprising amount of talk about from both male and female faculty - the idea that women were probably not as able to “see” radiographic images as three dimensional, because of a gender-linked difference in the ability to think about spatial relationships. One woman even anticipated this topic:

It is funny because I was thinking about saying that earlier when you were talking about 2-D to 3-D, I almost said, “well that is that thing that you always hear that women are not as good at that at space orientation. And I had always heard that. I can’t say that I notice it up in the clinic.

That is, I think, a very common myth, I would say that most people have heard that, I mean not myth but common thought. It is like, it’s one of those things, that maybe there is a trend, but even if there is, it doesn’t mean an individual woman isn’t going to be great at doing it and you
know those things wouldn't... but that's not really a true... that's interesting.

yeah, that's actually been published... and I don't know if that's environmental experience... I don't know that I can say that (that he sees it in class)... I've always tried not to draw the lines about... what behaviors I should expect... I can tell you what I observe... things I observe are differences in how they approach you, differences in how they look at you, differences in how they react to you when you make them upset... I mean, those are clearly gender based differences... I mean, actually, the only thing I would say is that in general the women are more conscientious students than the men... I mean, that's my general vision about... that. That they are usually... more mature, and usually more engaged in the subject... that's my view of it... now there are exceptions to that, but...

Yeah. I do believe that's true. I believe students, women, have a harder time with spatial relationships than men do. I really do. I guess that could go back to whether they played with Legos or not. It could be. Women seem to have a little harder time being able to turn things in their mind so that they can figure out a lesion or not.

your comment about women really intrigues me, because it's the first time I've ever heard that... ever. Now that's not the first time I've heard about the spatial orientation, and I think actually, on different tests, when they do those spatial orientation tests that that's true, but I've never heard that in terms of reading radiographs. And... it might be true. I think that part of the reason that maybe I... had not recognized it is the women that I work with... may have been preselected. Usually most people don't go into either surgery or radiology unless they're not struggling with it.

Oh, it doesn't surprise me that it was said. And they say that those are reasons why women aren't mechanical engineers, and women aren't architects, and women aren't all these things, and I don't know... certainly the people I know don't have a problem with it, but then they are those things! And so therefore, they may not have had trouble with it, and so they got selected in. If you were to look at the population overall, on the average, maybe it would pan out that there was more trouble.

But I think that people learn to compensate for those things. Let's say you DO have a little bit harder time with that. I think that because that person has lived with that deficit their whole lives, or whatever you want to call it, they learn how to cheat. There's no question that I do that.
One very interesting question to ask these very experienced teachers of medicine was "What makes for a good instructor? What makes for good radiology teaching?"

What I do is I do shadows, I do examples, I . . . try to use the specimens to give them some help because the specimens are in 3 dimensions . . . I'll be honest with you, and embarrassingly frank with you, my feeling is that I probably . . . there are quite lots of these students who are totally blank about this and I never know . . . I mean . . . how would you know it? Some of them won't say anything, some of the ones that do . . . I mean . . . a student approaches you, and they have a problem, and it's a serious problem, I don't think it can be dealt with in this laboratory . . . it needs to be dealt with one on one in some kind of . . . (interrupted by student question)

We have to put this on two levels. There are students who may have an apprehension about me because I am an African-American. If they don't have an apprehension because of that or if they have gotten past that, it is probably because of two things: One, I try to . . . when I am teaching them in front of an audience, I try to put myself in such a position where they see . . . (a) I seriously want to teach them, and (b) I am not afraid to do something that is totally silly, crazy, offhand in order to attract their attention and gain their appreciation of the topic. No single instructor can be the perfect instructor for everybody.

I think I tend to be a fairly verbal teacher . . . I think I tend to talk a lot, I'll work them through things, and I notice on days that I'm tired, and I do less of that, the dominant student always takes over. If you . . . so I think that the more active you are in a role of extracting information, the more they feel more relaxed in being able to say something and not have it be accurate, correct, whatever and you get them the feeling that talking and saying what they're thinking is ok

It's easy for students to be passive. It is so easy just to wait until the work is done and go home. It's just so easy to do that. To teach well, you have to use up a lot of words in an enthusiastic way. And it costs you a lot of stress to do it well. Radiographs are particularly hard.
Since much of the radiographic interpretation practice comes in the form of small group work, with four or five students clustered around a lightbox with a stack of “teaching films” (copies of cases provided to students because they illustrate a “classic case” of the radiographic signs of a certain disease or injury) either with or without their instructor, I asked these teachers how the personalities and confidence of the individuals affected the pedagogical process:

when she comes up to me and asks me a question, she might be so terrified of me that . . . I could talk to her and . . . what she really wants is for the encounter to be over.

part of it is that when someone else is looking at a radiograph and having a little difficulty and asking questions, most everyone else in the group probably has the same question. They are put on the hot seat, but whenever they are, “I thought the liver looked a little large here,” . . . “Well, why did you think that?” . . . “Looking at the stomach axis” . . . “What do you mean by stomach axis?” . . . “Well, it’s this, this, and this . . . No, No, that’s not what you mean is it?” It is all of that, in a small group, I think that you feel reasonably comfortable that what you say isn’t going to get you into too much trouble, and make you feel too stupid.

the person who speaks up gets feedback on her thought processes, and the other person doesn’t. But probably more than anything I think that if you are going to say something you are definitely thinking

Well, I think confidence is a big factor. Absolutely. Meaning, at first you have no confidence, you don’t think you’re capable of identifying the abnormalities from the normal. And so, you even doubt yourself. OK, let alone saying it. As soon as you see something, and you think “well jeez, I wonder if this is a big heart,” you even doubt if it is a big heart. You doubt your actual observation. So let alone that you’re gonna stick your neck out there, you even doubt whether its true in the first place.

It totally depends on, let’s say the culturally different individual. It totally is different for that individual. Imagine one American in a European
school. So they are a minority from the fact that they are from America, but they can still be Caucasian. The reason why it can make a difference is sort of like, . . . we were talking about it . . . are they afraid to ask questions, how about working in groups . . . if they do not feel comfortable working with the group, they are going to be left out in the cold. So, in our situation here, if you have a minority and that minority does not feel comfortable working with the group, . . . and it may not have anything to do with the group, . . . they may welcome the individual, if that individual wanted to participate. So, so I’m not putting anything against it, or saying that the group is turning them away, but if that minority does not feel comfortable working with that group they are going to lose out on the peer level discussion which is going to take place.

**Students speaking about learning to read radiographs**

The student interviews in this study were interspersed with the faculty interviews, and to a lesser extent were interspersed with small group recordings and observations. In this way, much of the data has been shaped by other parts of the data, and some of the questions to students were shaped by teacher comments filtered through the researcher’s thinking (as some of the questions to the teachers were shaped by student comments and observations made to and by the researcher). In large part, the questions to the students had their beginnings in the same interests and puzzlements of the researcher as in the teacher interviews, so they can be roughly grouped in the same way in this first attempt to show the data to the reader.

The public’s fascination with radiography as an icon of medicine was commented upon by one student in this way:

it was Greek two years ago when I came into vet school and didn’t know anatomy, and the vet I’d worked for would throw them up and say “Oh, there’s the stomach, the diaphragm, blah, blah, blah, and he’d say “Can’t you see it?” Nope . . . but it looked good. Looked impressive (laughs).
This student and others readily agreed to a fascination with the radiograph as a symbol of the secrets of medicine that they would soon be studying. The textual and instructional concern with a too-quick focusing in on a certain part of the film is also readily discussed by these students:

I do exactly what they told me not to do. “Look at everything and jump to the first thing you see and interpret that!” And I do that. I don’t know how many different people have said, “Don’t just go randomly “We’d put them up and I would go like, (looking all over) and then going for the brightest object. Making things up. It’s like an art thing, your eyes are drawn to the brightest object. So you are naturally drawn to the, you know, all the bones and the heart because they’re right there.

The instructional message about systems is also commented on:

I would situate it so that the head’s at one end and the tail at the other. Then I would try to go through what I should see and what I shouldn’t see then I look at the bones to see if anything is broken, and if they are then I would go from there. I don’t go from the center like they say, I just try to take in the whole thing and if I don’t see anything then I try to specifically pin point down different areas. Like maybe then I would go like from one side to the other. But I would try to get a general idea.

In these two responses, students affirm the textual method of radiographic interpretation while (and through) describing their deviations from it.

Deciding what is normal and what is not is explained in this way by students, showing a strong textual organization to the shape of their seeing - as well as an interesting corollary with Latour’s ideas about how pictures fit with text:

Because there is a list that says, “Dogs are this way . . . boom-boom-boom-boom. It should be this size between these ribs or it should be at this angle or this shape and then in that case they showed them on the thing, on the slides in class, and I looked at them, and I mean just the pictures fit with
what the words said on the paper. So I guess I was kinda taught that, but I memorized that. It's like "A cat's heart should be like one to two intercostal spaces wide and touching the diaphragm whereas the dog's doesn't." Stuff like that.

The experience of learning anatomy, and its application to the challenge of learning to read radiographs, was accounted for very differently by the students than might be expected by listening to their teachers:

Well, basically they, include them in the lab portion. And that pretty much, . . . well most people's first exposure to radiographs is during that lab period. They just kinda throw them up there and they don't explain them, no one goes through them with us, we don't see them in lecture first or anything like that, . . . it's just that they are put up on the side and it's our responsibility to walk around and look . . . everybody just kinda memorizes the, you know . . . the labels.

One student gave a very precise description of the different perspective that students have in the anatomy laboratory, where they attempt to reproduce by dissection the pictures in the anatomy textbook, as opposed to the rather pristine, two dimensional view of the radiograph:

Because you see, . . . very rarely do you actually get down to the bone, you are seeing all the muscles, we do all the muscles, you see all of the vessels and nerves, you see all of the abdominal organs, and heart and all of that, and that's what sticks in my mind, . . . I mean . . . granted, we have skeletons around the room to look at, but you don't see that

A very different type of visual learning than the intended type comes when students prepare for their first year exams. The few radiographs which have been hanging in the laboratory with label cards on them are used as test material - by simply removing the ID cards:
so for me I just walked around and you know, wrote down the names, They had to make you learn it by threatening to put it on a test, and then doing it, if you could remember what it said, they covered up the cards, . . . you could do it. They left them up but they covered up the cards and put a little arrow pointing to anything on there . . .

I asked these women if there was any difference between men and women instructors or fellow students in their group sessions:

They (men) don’t know how..they don’t know to..interpersonal communications. They have an opinion, they don’t know how to say it in a way..you know . . . if I have an opinion, I’m going to say it like “I think it might be this” or “I’m getting a feeling it could be this” or “What do you think about this” . . . not saying “It’s THIS. It’s gotta be this” . . . that kind of thing. So those pushy people who have an opinion say it’s this and the group’s used to hearing the other ideas . . . I’m picturing two men in my head.

In the Canine Anatomy there are three of us, myself and two other women. They are complete opposites, and I was kind of an inbetween. The one, my lumbar partner, she is really funny and everything but she is more of a high-stress person. She will stay up until like three o’clock studying and the thing that made that difficult was that she actually wanted the dog to be pretty meticulous and the other woman, she’s pretty laid back, she’s a mother with two kids. And then there is me, I could go either way depending on what we needed to do that day.

(Instructors threatening?) Not all of them, but some of them I kinda think they are distant. And maybe like their tone of voice in class, like they are more stern. I have asked some questions and I have been totally shot down before. Completely shot down! I will say, “Well, this is my understanding,” and they will listen to me and say, “THAT’S COMPLETELY WRONG!” Okay, Alright . . . and then I’ll say, “Okay, could you explain to me what is right?” And they do, but maybe after that I was mentally a little hurt, so the words didn’t sink in all that well. (Who shot you down?) Honestly? Most of them are men. All except maybe one.

We had two guys that were good friends, pretty outgoing, one’s Dad was a vet so a lot of times he was saying “Well, my Dad, I talked to him about
And two girls who, . . . I hadn’t met up until then, who were pretty quiet, sorta “grunge” type, and one didn’t know so a lot of times she didn’t feel comfortable, contradicting anything anyone said because....all she would say is, “I don’t understand.” Basically, we were all on the same level except when it came to these types of problems.

These students had quite a bit to say about the groups they worked in to learn radiographic interpretation, as well as the lecture portion of their instruction. This student specifically misses the interpersonal interaction in which visual objects are constructed:

...they’ll just take the pointer and then they’re talking to themselves, and not to the class and then they are circling stuff and I’m like, “I don’t see what you’re circling,” and then they’ll say, “Well, this isn’t a very good example.”, ...click . . . and they move on. So, actually I would find it better, I don’t know, . . . if someone taught it differently or if they changed it, because to me, I could have gone to the slide projectors, read a paper handout, and then just did it on my own.

Whereas this student seemed to do well with the interaction of images and text in the laboratory:

...when I really got it was when we were in a lab . . . and it was all up there, and you look at each one with a description below, what’s normal, what’s abnormal, and normals to look . . . compare with that. And then all of a sudden I really saw . . . that’s what they’ve been talking about in lectures.

What she does not mention is that this laboratory was filled with rotating groups of her peers, and interaction between students about the images and descriptions was almost unavoidable. Small group learning was sometimes, but not always, a good alternative:

If they are my friends, I feel more comfortable. I don’t feel so stupid saying, “well, I really don’t understand that.” It depends too, maybe because when I’m going through my notes at night maybe I might have forgotten something or maybe I might be
like a day behind, and maybe they’ll have it more down pat and they’ll go “oh, don’t you remember? Look over here” . . . TADUM! . . . so, sometimes it’s things like that that I might have forgotten. Other times I just don’t see it. But after they point it out, I try to remember it the next time.

My cardio one, that was mixed and that was just horrendous, because the guys in my group didn’t get along very well. And then, two of the guys and myself ended up being more of a tutor to other people and that was frustrating and we just had personality conflicts where we would be in our group for six hours where it would take other groups two hours.

So for me, . . . working with the group, it wasn’t just my brain that had to remember it, there were seven other brains that, you know, people were reminding me about stuff and once somebody had clicked onto something, then we could go from there. One student said that her hope for being able to read radiographs in practice came from the fuller context that she would have, compared to the relatively ‘sterile’ presentation of the teaching radiograph in group: if you took the radiograph you’d be looking for something, so there’s someplace to start, you at least have some possible system that you are looking at and I think that if I’ve gone to the trouble of taking this radiograph, I have to at least suspect something or at least there is something I know I want to start looking at, so at least that makes me feel better, somewhere to start.

But not every student likes the group situation:

I like to sit there by myself, and look at the slides, and read my notes and go through it, whereas if I am in a group, I just feel like . . . I can’t learn this way. That’s why I never . . . I’m never in there when I’m scheduled. I come in on weekends or at night, and do it by myself.

The most surprising thing in these student accounts was the dissonance between their view of the first year anatomy experience and that of their teachers. In these accounts, students seem in large part to accept the learning
experiences structured for them, with reasoned accounts of their deviation from them or lack of success.

**How can we read these accounts?**

To dismiss these accounts as not "the truth" would be as unhelpful as to see them as unquestionably factual. In this study, these accounts serve a number of purposes, and the number of their possible purposes defines a set without boundaries.

For those who are not medical students or teachers, there is a narrative benefit - a tourist's interest, if you will, in these tales. To call them an ethnography is to call down upon their innocence a connection with a wide spectrum of work, workers and ideology with which they have no true conjunction. They stand as the competently produced accounts of parties to the work of teaching and learning radiology crafted to the questions of an interested newcomer, although a newcomer whose familiarity with some of the stage dressing and players is presumed. There should be no apology for such a reading.

A second feature of these accounts is the manner in which they display for the reader some of the commonalities created by the entry of organizing texts into the work of these members. As was demonstrated in the review of literature, the canonical organization of radiographic interpretation is textually well developed. In both the accounts of teachers and of students, this
systematic approach is called upon as a resource for making a recognizably competent account of interpretation. Sometimes, the canonical account is used as part of a “contrast pair,” as Dorothy Smith has termed it, showing how (and more importantly why) an individual student has not followed the “rule”—as in this excerpt seen previously:

I do exactly what they told me not to do. “Look at everything and jump to the first thing you see and interpret that!” And I do that. I don’t know how many different people have said, “Don’t just go randomly.” We’d put them up and I would go like, (looking all over) and then going for the brightest object. Making things up. It’s like an art thing, your eyes are drawn to the brightest object. So you are naturally drawn to the, you know, all the bones and the heart because they’re right there.

In this account, the student tells us exactly why she does not follow the rule, while emphasizing through her account her intimate knowledge of the rule. This particular account can be read as a justification of the text, in that it explicates for the interviewer the “rightness” of the instruction to the novice to not focus on one area; since we have the novice’s testimony of the “naturalness” of the inclination to do so. Like Augustine’s tale of the pillaging of the pear tree, a moral tale is told of wrongdoing in the presence of the full knowledge of the wrong.

I think that I can see a number of these ‘moral tales’ in the accounts of radiographic pedagogy, and one interesting site for them is in the teachers’ and students’ accounts of the role of prior anatomy training in the learning of radiographic interpretation. First, the teacher says:

Some of the students don’t know the anatomy at all. and you put it up there, and they’re struggling to tell you that it’s a hock joint.
or they’re struggling to tell you even “the carpus.” And they’re trying to find bones and they can’t remember the names of any of them.

This account locates the pedagogical problem in the student’s lack of study of those things that were provided to them earlier by the foresight of the faculty. In it, there is an assumption that the students should not only know the anatomy at the time of their anatomy class, but should have remembered it for its applicability to this purpose. Contrast that assumption with the implications in this student account:

... well most people’s first exposure to radiographs is during that lab period. They just kinda throw them up there and they don’t explain them, no one goes through them with us, we don’t see them in lecture first or anything like that

This student was being asked to account for how anatomy had or had not helped her in learning to read radiographs. I believe that this account has many of the same features as the previous one; namely, that this student accepts as a burden of the production of the account that the anatomy experience “should have” helped - and then goes on to tell why any ordinary person would not have had that outcome given the actual events in this case. Her observations and report act to reconcile the canonical, textual organization of radiology pedagogy with the messy, “as-practiced” world of the student and teacher in a laboratory already too full of activities. It is an account that leaves room for the “rule” to work, or not to work - as the practical, everyday world dictates on each and every occasion.
Replay Structures

When engaging in "close looking" at interactions, sometimes there is a striking, repetitive way of verbally constructing meaning that stands out. It is part of this way of conducting inquiry to take interest in these technical achievements of the parties to the talk, and to take at least a beginning analytic interest in what they might uniquely provide to these persons’ understanding of one another.

In her work "K is mentally ill," Dorothy Smith first used the term “contrast structures" - to talk about differences placed by one person into a narrative to show a second person the relationship of one person or thing to another. In this study, I have found a somewhat similar phenomenon that I have called a “replay structure"; it is best talked about following an example from one of the previously quoted interviews:

Listen to this, this is important. When I talk to the students up in the Senior clinics, in my ward, . . . "How were you guys taught?".....They look at radiographs and get your diagnosis, . . . "well, we go through systems.".....is what I usually hear. You know "We'll look at the urinogenital and digest it, then we look at separate organs and this and that," but they haven't gone through an actual approach . . .

What I am calling the “replay structure" is in bold type in this interview segment. It seems that at moments in the structuring of an account, the person switches from the time and setting of the interview into an almost always theatrical recreation of a certain circumstance in their past experience. This is generally accompanied by facial and other gestures, including an
embodied attitude of being in the replayed place and bodily attending to that
place’s features. Vocal styles may change to indicate individual participants in
the prior activity. Then, just as seamlessly as this performance was begun, it
subsides into the previous tone, place and time associated with the
conversation. Without assigning psychological or other interpretations, it can
be simply said that it is a compelling method of emphasis and an interesting
way of bringing remembered action into an account. In this study, such
structures were as common as could be, though seemingly more used by
students than teachers.

The compelling nature of the emphasis may lie in the recall structure’s
ability to place the listener in a position to use their competence as a member
of the society to reach, first-hand, the same conclusion that the narrator
reached when presented with the situation. Consider the following excerpt:

We had two guys that were good friends, pretty outgoing, one’s
Dad was a vet so a lot of times he was saying “Well, my Dad, I
talked to him about this.”

In this recall structure, the listener is “caught-up” to the information
possessed by the narrator (that the one male student’s Dad is a veterinarian),
and then “placed in” the situation of hearing that student’s appeal to that
outside authority as a warrant for what he knows. It is assumed by the
narrator that the listener would reach the same conclusion as she did about
the reliability of such information. If the listener’s question is “How do you
know what’s on the x-ray,” then the account of exact methods used to judge
how information from other students is to be seen as accurate is a vital part of
a complete answer.

The power of the replay structure is such that it occasionally is used even
though the "replay" is itself an invention. Consider this excerpt:

... and we were debating something and one guy was actually
right about it and you know, he would say something and then,
you know, about five of us would go, "No, I think it's this." And
went through all of this explanation, and I think that he was
getting frustrated, but eventually he explained himself and, I
could tell that he was frustrated but he never said "look you
dummies, I know you're wrong and I know I'm right."

Here are two replay structures within the narrative of the same occasion,
but one is an actual replay while the latter is not, signaled by the phrase "but
he NEVER SAID" placed before the second. I believe, however, that this
"alternate replay" serves much the same function as the others, in that it
places the listener in the position of using their native competences to
imagine their evaluation of such a statement by a fellow student. It is an
economical method of account formation, in that it eliminates the need to
spell out the negative reactions that would have been generated by a
frustrated outburst - instead, the listener can complete the account by this
"triggering" of a societal reaction known-in-common.

It seems that some replay structures are composed of quite clever
combinations of verbal replays, gestural replays, and embodiments of
cognitive events, such as in this interesting excerpt:

maybe I might be like a day behind, and maybe they'll have it
more down pat and they'll go "oh, don't you remember? Look
As the listener, I took the “TA-DUM” in this replay to denote the moment of sudden comprehension which followed the coaching received from fellow students. A very interesting question is raised which I cannot answer - How did I recognize “TA-DUM” immediately, and without question or contemplation, as a reference to that moment of comprehension? These structures are very densely packed with triggers for our everyday competences as members of the society, and seem quite worthy of attention in their own right in future work.

Membership Categorization Devices in the accounts

Harvey Sacks gave the name “membership categorization device” (usually abbreviated MCD) to words and phrases in speaking that served to place someone in a known category - such as “mother” or “baby.” Consider the following:

We got... a pathology type person, got a ( )... he’s probably the brightest person in the class (ha ha) or in our study group. I mean... about four regulars. (the other two are) average. Small Animal... (Q) three women, one man. (my interest is ) mostly small animal and equine... both.

The respondents to this study know that I already know their larger membership category, that of veterinary student. Therefore, they tend to use with me the most common of the MCD’s among veterinary students, their primary future practice interest. This often takes the form of animal species,
such as small animal, food animal, equine, exotic or zoo animal, or as in this case, a discipline such as pathology or preventive medicine. In these interviews, I had specifically raised gender as a topic, so gender was used as an MCD. From my observation of veterinary students, gender is rarely used in the formation of accounts.

In another student account, MCD was used quite differently - and in conflict with what I have just said about gender:

In the Canine Anatomy there are three of us, myself and two other women. They are complete opposites, and I was kind of an inbetween. The one, my lumbar partner, she is really funny and everything but she is more of a high-stress person. She will stay up until like three o’clock studying and the thing that made that difficult was that she actually wanted the dog to be pretty meticulous and the other woman, she’s pretty laid back, she’s a mother with two kids. And she wants to learn everything too, but she’s fine. And then there is me, I could go either way depending on what we needed to do that day.

In the description of the first lab partner, there is an interesting double set of contrast structures; really funny but high-stress, and stay up until 3AM but want the dog to be meticulous. The first two are, by the account, normally compatible. That is, although funny and high stress define a certain personality, they are normative; they can go together. The second contrast is one of difference and deviation; she will stay up until 3AM studying (by this account, an OK thing to do, because the following statement implies as a condition that 3AM studying did NOT make things difficult) but she wants a dead, embalmed laboratory specimen to be “meticulous” - to somehow
"cooperate" in achieving a perfectly dissected specimen for the instructor to view.

Next, we get an interesting MCD based on gender - in fact, I would say the only one in this study to be said by a woman. It too, trades on the opposite of a contrast structure, in that it says that the other woman is "laid back," a "mother with two kids"; constructing the MCD of "mother with kids" as having the characteristic of being "laid back" as something known by everyone.

Some of the teachers in the study used interesting MCD's in their accounts:

You know, it's kind of interesting because you go through a transition, like when you are a resident and when you are a faculty member? And for me especially since I had been here, like when first I was an intern and a resident and then even when I was a junior faculty member, but like when first starting as a faculty member, most of those people knew, "Oh, she was a student here, then she was an intern here." You know those people knew and could identify with . . . I was just them but a little farther ahead. You know what I mean, so they weren't afraid of me, there was much more kind of, you're one of them. But the farther I get away from that, you know, I have students now who go, "Oh, you were a resident here?" You know, it's like I have now become like what I used to think of as . . . how I thought of the faculty members.

This is a wonderful account of how MCD's have shifted for this woman as her career has progressed, and how she and others in the environment have constructed and reconstructed the labels and categories over time.

The accounts gathered in this study are also replete with references to activities that form known-in-common categories for these respondents, and, they assume, for the listener as well. One example of such an activity is
"lecture," which is invoked frequently as a background understanding for excerpts such as this:

we had it in cardiology and respiratory, we see all these slides, see this pattern, see this pattern, see this pattern, and ... another thing that made it difficult, our notes weren't quite in sequence with the lecture and what was up there, so for me, I like to hear it and read it too, back and forth, and that's how I put it together ...

This brief account loses all of the richness intended by the narrator without the known-in-common experience of lecture at this veterinary college. The large, dim lecture hall with dual projection 35mm slides being projected as 20-foot high images, the 4-5" of class notes issued for this course, the daily wild variations in room temperature and the aftertaste of coffee from the hospital cafeteria, along with a million other sensations and experiences, are invoked by this account but lost to the text made from it.

One place where students use categories of activities to great effect is in their division of "schoolwork" from their future practice of "real" medicine. Consider this statement:

you know, I should never have a case where I'm just staring at a radiograph with no animal attached, no history attached. That kind of made me feel a little bit better, like I know what is going on. But, I can't remember if in class they ever said, anything about ... other than saying, "Now we are going to look at this.", and here it is.

In this account, there is a complex set of categories and work operating; first, the categories of "class work" and "real medicine" are starkly opposed, with real medicine being a place where there must always be a full context to go
with the radiograph. On top of this categorization of activity, there is a further
critique of the class work's simulation of real medicine, which complicates
the description of the radiology classroom as a place which often does not
provide the context needed to sustain the desired simulation.

Many parts of these accounts can be interestingly read for the construction
of activity categories, rules of conduct and procedure, and expected outcomes.

Group work has, according to these accounts, a norm of conduct that is
sometimes breached:

One example is that we have these () cases we have to do for
cardiology. And the last case we had, there were a lot of radiographs that
you had to look at, consulting with your group, and you didn't get to pick
your group, so... you know... I didn't always enjoy that... some of the
people... wasn't... you know, we didn't always work together... but we
worked fairly well together, we got the job done. But I remember one
particular radiograph was really tough... and we had some people
thinking this and some people thinking this... I was thinking, you know,
I had one opinion more so than the other, but both of them to me seemed
reasonable... it could be defended. But then it kind of comes down to
what goes on the papers, who's the most assertive person in the pushy
person... to write it down. That kind of thing. But (I saw the book) it was
neurological. Even though I liked one better, they were both readable,
could be interpreted both ways, and in the end, that was the answer. I
mean, there was one answer... I was the wrong answer, but the
instructor said both of those could be interpreted... it wasn't a wrong
answer to say that.

In this account, the following rules are oriented to for group radiographic
study: you accept not picking your own group, you work together, you get the
job done, you defend your opinions, you negotiate the written answer in good
faith, you don't get pushy. In this account, there is also an interesting
construction of the method of determining "right" and "wrong" answers as a
function of interpretation, defense, and (apparently) instructor acquiescence in that process. It seems from observation that group class work has these properties as a category-bound activity throughout the medical school experience.

It seems also, from these accounts, that the category of "real medicine" has the repeating construction of context and intentionality that is absent from the classroom, a "usefulness" that is not present in the interpretation of teaching films that is reflexive upon the job of interpretation:

if you took the radiograph you’d be looking for something, so there’s someplace to start, you at least have some possible system that you are looking at and I think that if I’ve gone to the trouble of taking this radiograph, I have to at least suspect something or at least there is something I know I want to start looking at, so at least that makes me feel better, somewhere to start.

Where is the sexism in the accounts?

When I began this study, I was sure that I would retrieve both accounts and classroom transcriptions of differences between men and women, though it was not the purpose of the study to seek them out. Based on the work of feminist researchers in the 1970’s, and the later, popular works of Deborah Tannen, it would have seemed inevitable that such differences would be displayed in the transcriptions and commented upon in the accounts. Also, it would have seemed that, given the large number of women in the study, that at least some would have voiced accounts based on feminist political beliefs or shaped by experiences of sexist behavior. Although I said to myself that I
would not actively seek such information, and would simply be sensitive to its occurrence and faithful in reporting it, I actually did think that there would be "lots of good material" that would support other feminist observations in this area.

I also made no secret of my interests in feminism and gender in the classroom to these respondents, either at the time of the interview or in my years of association with them. I did not pressure them into answering really specific questions on the subject, but I did in every interview bring up the alleged findings of gender based differences in spatial relations perception, based on such comments in the radiology education literature.

The results were much more linked to age than to gender - men and women alike in the age group of the teachers seemed to have heard of such studies, and tacitly agreed, though most all of the men and the women indicated that it mattered little as a matter of everyday competency, either because of the ease of compensation or that it was not much of a factor to begin with. Students seemed to have never heard of such 'studies', and also seemed to have little to say on the entire subject of moving from two to three dimensions. Students, in their accounts, ascribed group difficulties to individual personalities and to breaking the "rules" of group study, and not at all to gender based differences.

I have found an explanation of this for myself in the work of Dorothy Smith, and in the notion that some relationships, topics, categories and the
like can be ordered prior to face to face interaction by "extra-local" texts (in her account, texts can be more than just written texts).

There is a very strong membership categorization among veterinarians, possibly arising from their status as lower than "real doctors" (a phrase often heard, derisively, from veterinarians). I have often heard things like a Woman Veterinarian of the Year award disparaged on the grounds that "we are all veterinarians here." It seems possible to me that this organizing principle of the veterinary profession is already organizing the accounts of some of these people in a way that downplays gender difference. It seems, also, that the accounts of what constitutes proper group study work are constructed so as not to need gender as an explaining concept - were they organized in that way to preserve veterinary equality and downplay gender? Or were they organized that way for other reasons, and simply seem to have that action?

Could it be that my position as a member of the "power structure" of the College is so profoundly shaping these accounts that I might never hear stories of gender difference in the classroom? Or is it further possible that these women teachers and students will never discuss such issues with a male researcher? There are many questions that need to be explored around this "failed" part of the study. My own feeling is that the atmosphere, relationships and viewpoints of these students, like their curriculum and their schedule, have been profoundly shaped by influences outside their local
world that have shaped their accounts and interactions toward alternate accounts of these issues; the only remaining explanation, that it does not indeed occur, is not supported by the data generated by living in the rest of the world.

**Analysis of Transcribed Interaction**

Students in laboratory and in small groups, both with and without instructors present, were asked for permission to record their discussion about the radiographs in front of them on the viewers. This recording was then transcribed, and forms the corpus of data for this section. Names and any other identifying comments have been removed from the transcript, and transcription conventions are variously followed to the degree that they aid the reader in understanding the analysis (For readers unfamiliar with transcription conventions, please see Chapter 3).

Out of the myriad streams of analysis that could be followed with this data, seven are pursued in this study; measurement of structures, how normal is found, dealing with trouble, making use of instructions, getting on and off task, classroom order, and gendered moments. These topics will be pursued in the following seven sections, but they represent only a few of the topics made possible through the data.
Measurement

In session after session, comments like the following could be heard:

1: yeah but do you think the um
2: // cranial ve uh
1: [caudal vena cavas a little distended?
2: [caudal vena cava

There is no question in my mind that the first student knows exactly what she means when she says “a little distended”. However, no one has pulled out a ruler - in fact, none of them have approached closer than 3 feet to the radiograph on the viewer. Here’s another moment of “measurement”:

1. What’s going on here? That’s the trachea.
2. Look at that heart.
3. Four months old, female German Shepherd. Dog was presented to OSU for treatment for distemper. The distal heart sounds were difficult to auscultate. Jugular pulse appears to be present.
1. Is that that basketball heart that we saw?
2. Pumpkin heart?
3. Generalized overall heart enlargement. It’s only a four month old, being treated for distemper.
1. Is the heart that big, or can we just not see it because of fluid?
2. It’s big. Do the lungs look normal?
1. Yes.
2. Well, they look to me like they are thin, . . .
1. It’s pushing them. Okay, whatcha got?
3 “The cardiac silhouette . . .
1. Is that film upside-down again?
2. Oh my God! That’s it! Sorry!
3. No wonder we can’t read these things . . . “Cardiac silhouette is markedly enlarged, and round on both views. The trachea is dorsally displaced. On lateral the ventral portion of the heart and diaphragm are obscured probably due to free pleural fluid. There is no apparent bulging in the region of the left atrium on lateral.”
2. Okay. Sure.
3. “The dog is diagnosed with pericardial effusion. All causes of pericardial effusion should be considered including septic pericarditis and congenital pericardial diaphragmatic hernia.
1. That's a good one to have . . . he's only four months old.
3. Basketball heart! Big heart!

By this stage of their learning of radiographic interpretation, these third year students have gained a members' competence in judging heart size at a glance. What is to be negotiated is the terminology, and here, particularly the terminology as it applies to shape. This heart is not only large, but also more round than normal hearts. Therefore, in the first part of this transcript segment, we get four descriptions of this heart offered as equal; "basketball heart," "pumpkin heart," "generalized overall heart enlargement," and "big heart." Later in the segment, we get from the card yet another description, which is "Cardiac silhouette is markedly enlarged, and round on both views."

In the parlance of radiologists, economy is achieved through terms such as "basketball heart." As Harvey Sacks pointed out, these descriptions trade on the expectation that all present have already made the same analysis, and this description validates the fact that all have, indeed, come to the same conclusion. Because the things that radiologists look for are size, shape, outline and density (the so-called roentgen signs), descriptions of measurement are a vital part of interpretation. In this transcript, we are privileged to see the beginnings of the formation of common understanding and its' display and validation in the talk of these students.
Conversely, here is a transcript of talk between teacher and student where this claim of common analysis is displayed, but breaks down:

B: You want to (...)
S1: The one on the bottom?
We have a cotton candy appearing lung, which can be indicative of pulmonary metastases...
B: pulmonary metastases...ok
S2: (What does cotton candy mean?)
B: well its interesting...pends on who it is and what it is they mean by cotton candy. Some people use that just as a generic term. that means that there are...well, what does it mean to you?
S1: it means there's a...cotton...candy....
((entire class and instructor laugh))
B: that's why he took Swahili.

Contained within this transcript is a wonderful analysis of the use of these measurement checking devices; the teacher says that the meaning of these devices “pends on who it is and what it is they mean” by them. In this particular case, the student has put forth a claim of common understanding that is an unbacked note - due to the fact that he is a second year student, and cannot possibly have the understanding of lung patterns that his teacher, a board-certified radiologist enjoys. However, such is the commonness of this way of speaking that it is allowed to pass in the first exchange. Only when the measurement description is made a topic by another student is the invoked understanding questioned further.

There is an interesting aside connected with this transcript, that the reader may make of what she wishes. Notice that in the last turn, the instructor says “That's why he took Swahili.” In the beginning of this small group class, this
student had engaged the instructor, an African-American, in a rather lengthy discussion of the student's experiences when he took Swahili in undergraduate school. As a party to this conversation and a member of the culture of the school, I read this as a possibly ingratiating move, as did some of the students in the group - based on their gestures to each other. It is tempting to read the instructor's last comment as a link between a failure of that first claim of common understanding, African language and culture, and this failure of common understanding in radiologic measurement and description. Right or not, it had that feel to a participant - and was so analyzed by others in the room, if their glances and gestures faithfully followed their analysis. This is one of those moments where the warrant for my allegedly "professional" analysis of this sociological event in an educational setting is nothing other than the most everyday, practical reasoning of a member of this conjunction of cultures. It points out the utter seriousness of the everyday analysts' claim - "you just had to be there"; i.e., that any competent member of the society, without being able to say just how and why, could be relied upon to come to the same judgement when in the presence of the same action.

Finding Normal

One of the chief burdens of the teacher and student of radiologic interpretation is defining "normal" and the procedure for finding, displaying
and assuring normalcy. In this lengthy transcript from early in the second year, an instructor and several students work out the normal position, size and conformation of structures related to the trachea in the chest of a dog.

This transcript starts with the student pointing and questioning the instructor:

S1: (...) does it come down...is this..like...is the artery here..and the trachea’s..going..on that side of it...ssz the artery’s gn come out, you know, straight...if..I thought it wrapped...so and so...

B:Ok..well...ok....what, what directions can you see in this X-ray?
S1: the..uh..two..haha
B: which two?
S1: dorssalandven
B: Give me their precise names./
S1:/cranial an caudal
B: Ok, where’s cranial
S1: left
B: OK, cranial and caudal, and what else..what other dimension do you see
S1: (0.5)up
B: where’s dorsal?...where’s left and right?
S1: (0.3) you can’t see it but that’s what I just had ( )
B:thats right..but you can’t see it cause it’s..that’s in the plane of the( ) the elevational plane, so..it is ABSOLUTELY IMPOSSIBLE to say anything about left and right on a lateral xray..because if its not in your plane...now, I can tell you that PROBABLY if the dog was laying on his right side for this xray, PROBABLY that’s the right crus of his diaphragm...that’s how it usually works out with the radiopaque markers, that’s usually what it is..but but you..there’s no way that you can consistently know anything about left to right/
S1:/ yeah, I realize you can’t know that, I just wanted to know that in my head so that I know what I’m looking at.
B: Ok...well, the trachea, for the most part, comes..down..the mediastinum pretty much near the midline doesn’t it?
S1: umhm
B: it deviates a little bit to the right...kay? but then where does it end? where does the carina originate../..relative to the heart?
S1: /well it
S1: it appears below the aorta..like
B: kay...whyncha show me where it is?point it /out to me.
B: /no, point it out to me on the one on the left...
S1: (laughter)
B: /that one's all labeled...
S1: and um...id guess like um...in there/
B: /that's exactly right...so where's the aorta?
S1: here
B: /there you go...that's fine...ok...and...so where's the dorsal border of the trachea?
Show me the dorsal border of the trachea...for its entire extent...ok?...there...keep goin, keep goin, oh!...now what's that? ok...that's the carina...so what's the continuation there?
S1: well...
B: /what do you think that is?
S1: Its over top of one of the goin into the lungs, its just the bronchus/
B: /Well, that's actually the left main stem bronchus...the very...this very proximal part, right here, from here...to there...is left main stem bronchus/
S1: /ok
B: then it continues out to the caudal lobe, cause that's the biggest lobe in the body/
S1: /oh ok
B: but it also...its comin out of here...see the bifurcations...that little donut right there. That's one coming out at you...there are others going other directions you can't see...that's the right main stem bronchus, from there to there/
S1: /that one (....)
B: (That donut right there?)...not a very good donut... (Aside...I'll be right there)/
S1: that little teeny pea thing?
B: /yeah, that...
S1: /ok...alright
B: /its.its a small segmental and may be (...) you can see a bronchus...you can see the wall of the bronchus right here/
S1: /ok
B: /ok? So, the way to think about the trachea in this view is simply that it is located in the dorsal mediastinum...even if it were deviated to the right or to the left you would have no knowledge of that...if you look at a bulldog trachea...those babies come down...if this were a ventrodorsal view...they come down like this/
S1: (laughter)
B: /but you can't see that on a lateral view sometimes if its deviated up or down at the same time you'll see it has a little kink one way or the other...then you look at a VD view and its goin like this...and so um...you have to have complimentary views...um...the left atrium is here...alright? So, can you imagine that if the left atrium got very dilated...it would push up this left main stem bronchus...ok...as it pushed it up it would hit the bottom part of the ventral border of the aorta...and that's how it gets mashed. You watch these on the bronchoscope, what you see is you see that every time the heart contracts, the left atrium fills and gets big, the aorta expands the bronchus gets mashed, mashed, mashed, mashed, every beat...so...um...
S2: I was just wondering, you said the left is...supposed to persist, right, but if the right persists...then...um...the trachea kinks...would you say the trachea (............)
B: /you're talkin about the aortic arch now/
S2: /yeah, the aortic arch
B: /that's different
S2: /the...no the ductus ar...thu...um../
B: /ligamentum
S2: /The ligamentum arteriosum, yeah...that...you could just cut that...if it persists, right...and you have to cut that because...er...uh...the (...esophagus)
B: Well, not around the esophagus...yeah...around somepin...that's right...what...where's the esophagus located here?
S2: (.5) ummmmm....right there...dorsal to the trachea....
B: /(..)you can't see it...it doesn't have any air in it...no natural contrast for you to see it...so...what...this is a totally different issue, but if you have a persistent right aortic arch as opposed to the normal situation of a left aortic arch...and the aortic arch goes into the right...it winds up being on the wrong side of the esophagus/
S2: /alright

Here is the first problematic for the student in attempting to find what is normal - the student did not take these radiographs, therefore she has no experiential idea of how the dog was positioned over the unexposed film, how the beam would have passed through the dog's body, etc. It is as if you
were handed a snapshot of a landscape taken by someone else, and you were required to say what is north, south, and so on. In this segment, the teacher starts by trying to lead the student through what she can deduce from the image she has been given, and what cannot be deduced without having been there when it was taken. To continue the first example, you could hope to derive north and south in the snapshot from your knowledge of that area, but you likely could never derive the time of day from a cursory examination of the snapshot alone.

One of the most interesting statements in the entire study is contained in this transcript: "I realize you can't know that, I just wanted to know that in my head so that I know what I'm looking at." This follows the teacher's explanation that knowing right from left on this one image is "absolutely impossible."

My reading of this statement probably belongs in the section on "classroom order" as well as here, for my analysis (and I believe hers) trades on the nature of this radiographic laboratory as a pointed simulation rather than actual interpretation of radiographs. Since it does bear on the finding of normal as well, I will place it here with the request that the reader recall this moment when she reads of classroom order.

In all of the radiographic interpretation texts, lectures, and one on one instruction, the method of forming a concept of normal is repeatedly based upon viewing many, many films that are authoritatively certified as normal.
Consider this admonition from a second year lecture on radiographic interpretation:

The issue of radiographic anatomy, what is normal and what is abnormal, is an extremely difficult subject. And there is absolutely no way that we are going to be able to cover, and have you feel comfortable with normal radiographic anatomy in the horse, cow, dog, cat, in a whole course, let alone in a couple of hours. People have spent their lifetimes as veterinarians, trying to ascertain, “Is that normal or abnormal?” You’re not going to do it quickly, and you need to be patient with yourself. It will take time, and part of what we will do in this course is to try to provide you with as many normals for comparison as possible, so that you have a fighting chance to determine what’s abnormal. I’ve given you some references there, Thrall, ( ) and Wilkins, Myabiashi - and I hope that you would use those references to work on this issue of normal radiographic anatomy. You’ve got to know what is normal before you know what is abnormal.

So the message is clearly given to the student that the formation of the concept of normal is firmly based on images certified as normal by expert interpreters. This student knows that the laboratory film she is looking at is just such a film; selected by her instructor for its value in creating her concept of normal. It is not “just any film” made of a clinical patient, nor is it a “found” film, it is instead part of a planned simulation - as such, it would be reasonable to think that the instructor “knows more than he is telling” about this film.

I read her statement in that light. That although she knows that, canonically, it is not possible to tell left from right given just this view of the dog, that it is highly likely that the instructor DOES know that information, and could share it as a temporary learning aid. Just as she does not expect to be
dependent forever on the certification of normal by experts in books or in the laboratory for her concept of normal, she does not expect to forever be able to know this additional "left-right" knowledge. Once she "knows what she is looking at," she will move from simulation to practice, and have no need of this special assistance. Right now, she would like that help as she forms her concept of normality.

What is really stunning is that the instructor instantly reads this comment in that light, in that he immediately launches into an explanation of what structures might be found on the left and right, and what few evidences might be found of them on this particular view. He provides exactly what she has called for, a simulation-breaking extension of this film out of his special knowledge- crafted to extend her concept of normal structures and their position. This student has crafted an exceptionally economic and successful request, coupled with an incontrovertible warrant for the request based on the canonical pedagogy of normal.

In complement and contrast, consider this transcription of three third year students (without an instructor) who are totally reliant on their memory and formed concepts in evaluating normal on this radiograph:

1. Okay. Looking at this, the bone looks very - - not dense, to me. Up here it's like, it looks pretty smooth though, you're looking for a rough margin, (Bad portion of tape!! Impossible to understand) (Are you driving home?.........Be careful)

(MORE NOISE)
1. It looks like the bone is like, coming and curving in and it looks like there's a depression right there. I don't know. I don't understand why this white line is here. Kinda like a white spot in there.
3. Hmmmmmm....and then there's .......the IM cavity looks a little bit fuzzy.
2. "IM" cavity? Is that a certain cavity that I don't remember?
3. Inside the bone.
1. I even caught it...intramedullary.
2. Takes me awhile!
1. Okay now. Another question. It's a one year old dog, so technically, it shouldn't have growth plates,.....right? Or will they still have growth plates?
2. Probably depends on how large they are, right?
3. You can see that and you can that,.....especially for a Doberman, I think they still can.
1. I mean, why isn't there a growth plate there?
3. Hey, aren't the German Shepards the only ones that are supposed to have a growth plate there.
2. I don't remember. Why would they have a growth plate there? Is that a growth plate?
1. Where is the coronary ( ) process?
1. Where is the (ank.................)?
2. Oh really? I thought that it was somewhere in the joint or close to the joint.
1. I don't know. I'm not disagreeing with you, I just don't know.(.........................)

   Okay, then what's the answer. Let's go that way.
2. I was just thinking, once a growth plate has mineralized in, don't you than see a line? Or not?
3. This is a growth plate. So I guess that could be. Yeah that looks like one. It looks like some kind of growth going on there.
1. So we think that the scapular and humeral joints look normal? Right?
2. Yeah, it looks like,.....round.
1. That first one, do you want to read the answer?
3. Yes! It's long, Oh my! (Reads.....“The right shoulder joint is radiographically normal although evaluation is impaired by underexposure..............)
1. “Underwear is white, that's how I remember....underexposure...too white. Like your underwear is white. Emma made that up.
3. “So I'm not the only one who makes those stupid things up?”
2. “What if your underwear is dark?
This transcript starts with several observations - a lack of density overall, and smoothness of the joint surfaces, coupled with a white line that is problematic. Before that white line is taken up, however, there is another observation about the intramedullary cavity that starts a side sequence. I call the IM discussion a side sequence in that it is addressed to answering Student 2’s question rather than evaluating Student 3’s observation about the cavity. The side sequence ends with Student 1’s “OK now,” when the subject of the “white line” is taken up by the discussion of growth plates. It is part of the member’s knowledge of radiology by this point that one of the most likely things producing a white line across a bone is a growth plate (a very active bone-producing area that is found in young animals and which disappears after full growth is achieved). It is a measure of their competence that they hear Student 1’s question as a very likely option, and do not question why the subject of growth plates has been raised. As the discussion of growth plates continues, Student 1 moves on to the identification of other structures, and finally moves to a call for “the answer,” while the others continue the growth plate discussion until its finalization with “yeah, it looks like one.” The following sentences refer back to the very top of the transcript, where the joints were described as “pretty smooth.” Student 2’s answer, “Yeah, it looks
like, . . . round" is a second part in agreement with the first assessment of "pretty smooth."

The last four exchanges of this transcript are interesting on several counts; first, as an account of the formation of a rule of thumb, and the display of the common nature of the activity of making up such memory aids, and secondly as an example of disattending a comment as an evaluation of that comment. Notice that when Student 2 says "what if your underwear is dark," the response is for Student 2 to continue the reading of the answer card. Making a rule of thumb work requires that indefiniteness and contradictory cases be accepted as unmentioned; the breaching of that requirement is taken care of here by simply not attending to it.

Paul Atkinson makes the distinction between signs and symptoms; that signs are those things that anyone might be able to observe while symptoms are an interpretation - a construction of those signs as part of a discourse about a disease. Radiology pedagogy makes that same distinction. Students are advised, in texts and in class, to look for the so-called "Roentgen signs";

Roentgen signs have been defined as changes in size, shape, number, location, margination, and radiopacity. By describing the lesion according to its roentgen signs, the error-prone method of immediately jumping to a diagnosis because the lesion looks like something seen or heard about before, the so-called "Aunt Minnie" approach, may be avoided. (Thrall, 1994)

The Aunt Minnie approach is well described in this student handout;

I recommend the approach to interpreting radiographs that first describes the radiographic signs (findings), summarizes them into a radiographic diagnosis, and then based on the clinical information generate a
prioritized list of things (gamuts) which may cause those signs—as opposed to the Aunt Minnie (sic) approach. The final step then is incorporating the clinical information with radiographic findings to formulate a radiographic impression.

Aunt Minnie is a heavy lady who always wears a blue dress and hat. Therefore, when you see a heavy lady with a blue dress and hat you recognize it to be Aunt Minnie. Obviously, the problem with this example is that another heavy lady (or man) may wear a blue dress and hat and therefore be mistaken for Aunt Minnie. (Scrivani, 1996)

It is possible to read these transcripts in this way; look for when and how this admonition to look for roentgen signs is followed. When is size, shape, location, margination (the smoothness or roughness of outlines) and radiopacity (brightness or darkness on the film) an explicit topic? When and how does the discussion switch from those observations to a discussion of disease? Most relevant to this section’s discussion, when and how is the “normality” of size, shape, number, etc., defined, decided, or recalled and warranted?

2. Okay, so this is pleural effusion, right?
1. Yeah. There is water density surrounding the air.
2. And outlined by soft tissue density..... Fluid is more in the left than in the right. It is more grey on the left than on the right. The darker one would be more air.
1. Oh, wait a minute, what did you say about left and right?
2. The fluid is more in the left than in the right.
1. Okay, I think that you can see this, this area looks thicker.
3. The “thing” always means left side.

In this brief excerpt from some third year students, the definition of pleural effusion is placed on the table, and validated by the second student’s “completion” of the definition. The concept of normality between the left and
right lungs is then defined by Student 2 in a cascade of propositions - fluid is more left than right, because left is more grey, and that is because of air’s density versus that of water - but this calls upon the shared remembrance of all present that both lungs, being normally full of air, should look equally dark. In this case, finding normal is achieved by pointing in discourse to a remembrance of previously observed signs.

Sometimes, the remembered normal does not match. In these cases, the discourse explores how an abnormal observation might be placed in a special category of normal - repaired, if you will, by the observation’s construction as part of a special category of normal produced by circumstances and not by illness. The following brief transcript is an example of such an outcome:

2. The head looks bigger to me.
B. Let’s look at the other lateral.
2. It’s magnified.
B. I don’t know why the hook looks a little different. It looks like it is in a different plane for some reason. Like it’s tilted this way a little bit. But that seems hard to believe,....
1. Well, the dog is a little....... 
B. Yeah, maybe it’s him Maybe he’s a little crooked.
1. Either that or they are (opposite?) Lateral positioning. They kind of look like opposite laterals, but....... 
B. Actually also, our loop looks different too, so it’s probably just taken from a different angle.
2. Is this just free, or did you attach it to something? 
B. We attached it to the diaphragm. You want to leave plenty of slack in the wire here so that it doesn’t tug on......if this moves this way, it wont tug on the wire, I mean on the lead.

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The "head" and "hook" referred to here are the parts of an implanted pacemaker that lie actually within the heart. These discussants have seen and handled the pacemaker device prior to implanting it, and so have a clear recollection of what these parts look like, and how they feel. The discussion starts with a suggested repair based on magnification alone (the effect produced when something in the body is relatively far away from the x-ray film, thus casting an image larger than its actual size), and quickly moves into a repair that includes both the position of the dog and the position of the x-ray tube with relation to the film. The evidence that this image has been successfully categorized as normal is Student 2's question, which introduces another topic which is readily taken up.

This piece of transcript also illustrates the importance of "views" to the finding of normality. A "radiographic view" is a strictly defined combination of the positioning of the patient, the equipment, the radiographic film, the lead markers on the film, and finally, the position of the processed film on the viewing box. Considerable time in the curriculum is spent instructing students in how to produce the field of view of each body part so that each film shares as many "normal" characteristics with all other films as is possible. The most common textbook of veterinary radiography says it this way;
An unfamiliar image of a familiar object sometimes results in the object’s not being identifiable. Therefore, patient positioning for radiography is important and must be standardized. We become familiar with the radiographic appearance of patients as a result of positioning them in standard fashions. (Thrall, p5.)

The illustrations that accompany this statement are two radiographic views of a pair of glasses; first from the front, as we are used to seeing them on the face and where they retain their “typical” appearance, and the second view being a radiograph through the glasses from one side to another - causing all of the structures to be superimposed upon one another and losing any relation to the everyday appearance of a pair of glasses. The point of this illustration, and of this section generally, is that a finding of “normal” on a radiograph is constructed in many stages, often in need of repair, and always contingent.

Schoolwork

The next section of this discussion takes up, without complaint or irony, the analytic view of these exercises as school work; that is, that these sessions of radiographic interpretation do not have the motivations and resources of interpretation in a course of medical practice, but instead have the motivations and resources of the everyday work of these women as students of medicine.

Here’s a quite blatant example:

SF2: so .i mean. if you have this many lung problems eets noot goooood. if thats fluid. or if thats pleural effusion. or if that atelectasis its
something wrong with the lungs which means its something wrong (with the heart)
SM1: why does it have to be a problem with the heart? cause they ( ) us that these animals have cardiac disorders?

The second student is trying to find a warrant for the assertion that because there's something wrong with the lungs, it also involves the heart. In search of that warrant, he turns to the grounds that this is a classroom exercise, and in fact, part of the Cardiology course in the second year. The fact that this is a "heart course" becomes a candidate to be a solely sufficient resource for one of the interpretations that this student makes about this film. In actual medical practice, each film is accompanied by the great chance that it is completely normal. It also bears the possibility of showing signs of a disease that is completely unsuspected by the person taking the film. Not so in these group and laboratory exercises, where students have and use the resource that these are so-called "teaching films" that do hold signs that relate to the subjects at hand.

Another resource absent from the practice of medicine is that many other students are also working on the very same case - often, up to 60 others at a time. In this way, there comes to be a degree of community interpretation that would be unachievable even in hospital practice where there are others to consult with. This is in no way "cheating", as these students are given these films as a learning exercise and not as an evaluation. Here's a transcribed moment of a call to such a resource.
SF2: i mean..i didnt hear anything else. people seemed to have
like no idea what this was
SM1: noone suggested that any of these were ruptured
diaphragm?
SF2: i heard one person say it. but .i dont believe it. because
when you can see the diaphragm here. there. and then
you dont . th theres something wrong up here with this
lung and theres no if there were a ruptured diaphragm on
this side. this should.this lung should ( ). and then
gravity ( ) i mean it could be, its not like im totally
adverse to the idea, but i dont right now...
SF2: I'll ask. I'll ask around and stuff.

Another interesting feature of this work is the easy availability of
authorities other than textbooks. In medical practice, getting a more expert
opinion takes reasonable time and effort, and has the aspect of having to
acknowledge a special need for help. In the student situation, more expert
interpreters are easy to find, and there is a much wider range of situations in
which asking for assistance is expected and encouraged. This next piece of
transcript, which in another sense is produced to warrant the speaking
student's assertion of her interpretation, reveals that this mechanism has
been operating:

FS1: nope.cause that. i asked dr. blank not about this case but
she said that really needs to come out here she says people
wanna overinterpret right heart disease . because it. This side is
much flatter than that side na naturally. so um. so i im not
saying that youre wrong im just saying that
FS2: //no i mean
FS1: // my my my guess was a lot
more right heart
(lots of overtalk)
FS3: so then what are we saying for the heart other than the
pulmonary artery?
The next transcript shows two interesting features of the pedagogical twist to this exercise:

FS1: I've a really bad habit when I look at x-rays if there's something on there that I'm not sure about I pretend like it's not there
FS2,3,4: (laughter)
FS1: cause I had like now that I look at it for the second time I didn't even see it so ( ) I just blocked it out of my mind
FS2: i think it could just be summation cause that. apparently. i mean I don't get this but like uh the arteries just torturous and I remember the one in class it was like, snakin all over and I didn't think it got that big and whatever and

The first student openly confesses her problems in interpreting these radiographs, and that she chooses simply not to deal with vaguenesses and uncertainties that she finds, which draws a sympathetic laugh from her classmates. Toleration for uncertainty and the novice status is certainly not part of the everyday practice of medicine, but it is part of the world of the student. An interesting warrant is given by student two, in her statement "I remember the one in class." Medical practitioners and teachers often relate remembrances in their explanation of signs or their warrant for their diagnoses, but these tend to be of two types; personal experiences with clinical patients, or published research findings; rarely would you find a classroom experience or memory being called upon by a practitioner. It is, however, a part of the work of a medical student to frequently use such memories or references in accomplishing the work of the day:
Students must also deal with differences between what they know to be the norm in practice and things that are only done in a “teaching hospital.” All of these students have had some degree of experience working with veterinarians in practice prior to their admission to medical school, and they recognize and deal with these deviations from normal medical practice:

2. This x-ray was taken when the animal was normal.
1. Yeah. This is November just when she had her spayed.
3. Why did they take an x-ray when she was spayed?
   1. I don’t know. Maybe to provide us with a normal abdomen.
   2. Maybe because it was OSU.........Okay, so she is severely dehydrated and what?

Even deficiencies in the quality of radiographs can be interpreted using the classroom situation as a resource rather than a knowledge of medicine. In this excerpt, two students have just walked up to a wall mounted viewer in a laboratory period, and are looking at a set of “unknown” radiographs of a dog’s chest and abdomen:

S1: there’s not much abdominal detail...
S2: cept’ what you do see is all shifted...
S3: left...( ) i’ve seen that a few times now and its not abnormal.

Student 1’s comment works from the analytic resource of the knowledge that this is a teaching film in a laboratory - therefore, the “point” of this radiograph must be visible. If an area contains no detail, it likewise must not contain the “teaching point” of this exercise, and further the likely point of this exercise designed for novices is going to be exceptionally clear and well
exposed. The second student disputes the observation, not the analytic resource, in claiming that there is indeed faint detail that is "shifted," that is, that the abdominal organs are moved to one side. The third student accepts that observation, but claims on the warrant of her experience that it is "not abnormal" (in itself an interesting phrasing).

There is actual classroom type interaction available for analysis at this site, and it follows closely on structures previously identified in the literature.

Consider the following interaction between student and teacher:

B: What comes in between soft tissue and fluid density and air density?
   (3.5)
S: soft tissue mass density?
B: (.5) well this...there's
S2: Fat!
S: fat.
B: Wonderful! I like the way you just picked that right out of the air...ok, so you have fat thats/
S2: / / s a group inneraction thing
B: / / s right

There are only five radiographic densities; air, water, fat, soft tissue, and mineral. Students at this level are generally expected to be able to rattle these off - which does not happen in this case. The 3.5 second pause, as well as the phrasing of the answer in a questioning tone both serve to put the room on notice that this student is in trouble. Then, the instructor pauses after the answer in another well documented sign of negative answer evaluation. The instructor then stumbles a bit in beginning to formulate his next turn. At that
point, a fellow student provides the answer, which is picked up by the first student. As I said previously, I take the exchange between Student 2 and the instructor to be a mild, humor-disguised reprimand, followed by a like "apology" in the student's acknowledgement and return of the "group interaction" rationale. This is fairly typical stuff in previous ethnomethodologic and conversation analysis studies of classrooms.

B: Now, they call this metastatic disease. What does that mean to you?
S-1: That it's a primary.
B: A primary what?
S-1: A primary neoplasm.
B: Ah! Thank you. I like it. I like it when people fall into my tiger trap.
S-1: Metastatic disease!

Again, here is one of the most recurring and commented upon structures, the IRE or initiation-response-evaluation sequence, with the interesting addition of a seemingly positive evaluation in the teacher's third turn, which is actually negative - the proof of which is that it draws another candidate answer from the student in the last turn of the transcript. Although there are many of these moments in the classroom sequences recorded for the study, they do not add to our knowledge of radiology pedagogy except to say that these too, are classrooms.

S2: /or completely filled
T: /because its down, yeah definit
S2: /so if its just fluid laying on top its not in
T: /on the top
S2: /ok
T: yeah
S2: ok (2.0) got it (2.0) thank you

I did find some interesting “leave taking” structures in this study like the one above, in part because in the large laboratories faculty instructors are often moving about the lab and entering into and leaving group discussions in a way that does not routinely happen in classrooms.

I find this bit of transcript interesting primarily for the last line. I believe that three very distinct analyses are being made between the pauses of these utterances. The “yeah” and “ok” close the turns at giving and receiving information between student and instructor. Then, my reading of the two second pause is that the instructor is allowing for further questions about that case, which the student closes with “got it.” Then, there is a further two second pause, which I think marks the instructor’s providing of a space for the initiation of another topic by this student, or the question of another in the group. This is terminated by the instructor’s move away from the group, which is absolutely concurrent with the transcribed “thank-you.” The full analysis of these initiations and closings would be interesting technically, but again add little to an understanding of radiologic instruction other than to highlight its congruence with other small group learning situations.
Dealing with trouble and success

In any attempt to follow instructions, there will be trouble; moments where the canonical accounts of the world contained within the instructions fail to fit the local circumstances. There will be success as well: the students in this study often ran into such trouble and success, as in the following piece of transcript. They are looking at radiographs of the heart, and find them unremarkable - but the “answer card” says that the patient died soon after the films were taken.

2. This side is the right heart, I would expect this heart to be bigger.
1. Except I think that you’re right, the apex might be shifted a little bit, but see how rounded that is?
2. All through here.
3. Yeah. I don’t know how huge it is, but it does look like it might be a little big.
2. Okay, so put the other one up and see if we see anything.
1. Okay, the arteries don’t look that big.
2. But maybe if we actually measure them.
3. The one, I was thinking, looked a little prominent with this one here.
1. The only thing that say is, “Slight increase in interstitial pulmonary opacity.”
2. ( ) Caudal lung lobe.
1. Okay! It says on the radiographic diagnosis on this is essentially unremarkable. Case disposition: The animal died two days after admission in July.
2. GEE!
1. An initial heartworm evaluation at the time of the ovarian hysterectomy with the appropriate treatment at that time would probably have prevented the heart disease.
2. Nothing from November to July.
3. Yeah, but if you looked at this, heartworm wouldn’t even be considered.
1. Remember the arteries on the other one?
3. Yeah.
1. It may be a little bit bigger.
3. This one looks okay, and that one looks okay. The only one that stuck out a little bit was maybe this one......
2. This is November........This is November! Why would you heart test? Excuse me! You wouldn't even think to.
3. Remember that this is back in '74, and they didn't know that much then. But if we have....if we bring a dog in, that has not been heartworm tested, we would probably test them.
1. Yeah, you have to do that now, right? Test before you put them under anesthesia?
3. I think that it is basically,......I don’t know whether they consider it a breach of standards, but they might.
1. Apparently, this looks like the owner’s fault. The animal was presented in acute collapse with ( )Chronic cough that developed following surgery, so maybe the owner should have brought it in earlier.
2. Is there like a reaction to the anesthetic agent? Can there be? Is that why you have to be sure that you test?
3. I think that any anesthesia puts a strain on the heart and kidneys and liver.
2. I just wonder if there was any kind of reaction?
3. There might be, I really don’t know. But if there is any kind of compromise in the lungs ( ) in pulmonary disease. I don’t know.

This assignment, up until now, has been about finding in the radiograph enough visual evidence to acquit the diagnosis on the answer card. Suddenly, in this case, there is absolutely no correlation between what is to be seen as abnormal on the radiograph and the clinical outcome of the case. What is interesting to me is that there is very little discussion about the fact that these women were absolutely correct in their evaluation of the radiograph provided to them! Their success at interpreting these radiographs goes completely unacknowledged. Nor is there discussion of the fact that they
have been provided with an essentially normal film for the first time in their learning about radiology. The rest of the discussion of this case is ethical and moral, seeking rationalizations for the death of the patient and seeking to affix culpability.

In this transcript is a baffling moment of both success at interpretation and trouble in creating an account consistent with both film and “answer.” It is tempting at such moments to theorize about socialization into dealing with medical failure, or to speculate about the shock of first losing a patient, even in simulation. The facts are, however, that the talk shows a facile, unmediated switch from a correct group interpretation to an accounting for medical failure that is much more like the talk of experts than of students, and it is opaque to my understanding why there is no acknowledgement of success.

In other circumstances, success is displayed proudly:

3. Are you sure that we didn’t get the ones with the...the artifacts ones? Is this like shadow,...the bone edge is right here, right? What’s that? Is that just the soft tissue? Or is that the bone edge too?
1. I think that it is the other....trochlear ridge....it’s so far out. It is so white.
3. I think that it is because you don’t have the two trochlear ridges on top of each other.
1. This would be your tibular tuberosity growth bone. But I don’t know what is happening in here. That looks odd to me.
3. Why....you’ve got all of this out here.....up in here.....and then you’ve got a radiolucency. But most of the muscle mass is behind the stifle.
1. Is there a tip of bone in it somewhere? What's that thing?
3. Oooooh. A good one! There is something going on there!
1. Good one! Lucy! Let's read the answers!!!
3. (Reads..........Radiographic findings: Lateral views presented here...etc......................)

Unlike in the first segment presented, success here is noticed, pointed to, and rewarded, and it shapes the next action - that of reading the answers.

Failure, too, is often acknowledged and repaired, such as in this segment:

2. Four cases for pregnancy evaluation.
1. Oh, look at that.
2. "Two cats and two dogs have been radiographed for evaluation of pregnancy."
1. Oh, get this! "Determine if pregnancy is normal, the approximate stage of pregnancy, and whether the fetus is normal.
2. Oh come on, wait......wait! Where is the imprint?
1. Yeah, there's a head......that's a monster. There were supposed to be two dogs and two cats.
3. Oh, this is "B", this is the same dog. Put it back up there. Yeah.
2. Looks like this one has got to be pretty close.
1. Okay so we are going to go with one.......last trimester with that one, one puppy.
3. Here's an "A". This is a beastly dog to begin with.
1. Here's one over here, and here's a head over here.
2. I think that there are two.
1. Last trimester? Okay. Two in last trimester.
3. Two cats? What is going on here? This doesn't look normal.
1. They are all in a little ball. They shouldn't be. They should be in the uterine together.
2. They are all balled up......that could be his back.
3. Second trimester........
1. Two kittens.
2. Case A........."Lateral view shows two very well calcified fetal skeletons ( )
3. Okay, so we got two. But we didn't say that they were calcified.
1. I'm thinking mummified!
2. Okay. Two cats. "When determining the number of fetuses present, you count the number of skulls or the number of spines. Normal pregnancy."
3. So they're normal.
1. What case?
2. B. "Lateral view demonstrates a single calcified fetal skeleton (in the abdomen....... It is a mummified fetus.
1. YAAAA! WHOOPEE!
2. "Also we have a luxation at L-7, S-1. Cat is paralyzed at this time.
3. Geeez! I guess. Oh Man!
1. Oh my God! Look at his ass!
3. I was looking for babies.

This transcript may demonstrate for the reader what actually happens when there is what the usual radiology education study calls "satisfaction of search," as well as the often mentioned tendency for beginners to focus too soon and on the brightest object. In this case, the "history" card directs these women to evaluate the pregnancy, the stage of pregnancy, and the condition of the fetus. Most of the talk of the transcript is directed to these tasks, and the fetuses are indeed very bright and unusual objects that are quite easy for even the untrained to find in the abdomen. Most lay people, upon looking at a radiograph of the pregnant abdomen, would know what they were looking at. The success of the group is celebrated, but is short lived - because the patient additionally has a broken back (luxation at L-7, S-1), which they completely missed.

Two students simply acknowledge the miss, with "geez, I guess" and "look at his ass." The third acknowledges the 'rule' that has been violated, with her "I was looking for babies." It seems that the students in this study often used some rephrasing of the canonical instructions in their repair of troublesome situations.
At times, students vocalized to classmates their insecurities about these moments of trouble:

FS1: I've a really bad habit when I look at x-rays if there's something on there that I'm not sure about I pretend like it's not there
FS2,3,4: (laughter)
FS1: cause I had...like now that I look at it for the second time I didn't even see it so ( ) I just blocked it out of my mind

Gendered references

I thought that there would be many, many moments in these transcripts when gender based comments would be heard, or when the occasional male student who was (by lot) part of these groups would take over the conversation in ways noted by feminist researchers and discourse analysts. It simply did not happen. There were a few widely scattered moments such as:

2. Oh yeah! Look at that. That's his penis.

1. No! Right there is the os penis! Look at these little round things.
2. Where's the urethra?
2. Somebody put some "peas" up there. He's got peas in his penis.
3. We hope you're enjoying this. Are you ready for me to read? There are some in the bladder too. "They did a urethroscopy and cystostomy and the animal made an uneventful recovery.
2. They say that passing one stone is like having a kid.

The "we hope you're enjoying this" is directed to the researcher listening to the tape at a later time. This segment well demonstrates the personal style of Student 2, noted in a number of segments, and the disclaimers issued by her
classmates after her jokes. But it really cannot be read as bearing on a
discussion of gender in the talk of these groups.

B. The biggest thing on topical preparations on wounds is, general, the
value that they have on the wound is marginal at best, so the thing to do
is to pick something that has at least no detrimental affect. You know a
lot of times in large animals they spread on Topizone and some of those
other......
1. Petermyacin.
B. Petermyacin. Hey, what is happening with that dog? Has his penis
gone down, is it looking better? That case that they had.
1. Oh I don't know. Did they put Petermyacin on it?
B. Petermyacin? Yeah.

This might give a little more purchase, as a senior surgeon and a male
student, in a group which includes three women students, repeat and repeat a
sophomoric play on words of the name of an antibiotic paste. This is the only
such moment captured in some thirty-plus hours of data recording, however,
this is one of the few times that a male instructor was present, and one of the
few times that an instructor was present at all.

Suzanne Damarin first drew my attention to a feature of this data that I had
completely overlooked, which appears in this previously discussed transcript:

2. B. "Lateral view demonstrates a single calcified fetal skeleton ( in
the abdomen........) It is a mummified fetus.
1. YAAAA! WHOOPEE!
2. "Also we have a luxation at L-7, S-1. Cat is paralyzed at
this time.
3. Geeez! I guess. Oh Man!
1. Oh my God! Look at his ass!
3. I was looking for babies.
In this transcript, the students (all female) have been examining at length radiographs of two pregnant animals. Student #one, at the moment of discovering that the animal additionally has a broken back, says “look at HIS ass.” This switch in gender reference is doubly surprising, given that pregnancy has figured largely in their previous discussion.

When this was pointed out to me, I went back through the data used for this study looking for similar instances. I found many, many references to the animal as “it,” when in all cases the gender was known to the group. I found one other instance of gender switch in the talk, in Transcript 13 (Appendix A).

By way of analysis, I can only say that calling the animal by the proper pronoun is stressed in the clinical part of the curriculum, which these students have not yet experienced. At this stage, they are dealing with films detached from both animal and owner, which may bear on their indiscriminate use of “he” and “she,” along with the societal construction of the male pronoun as preferential as spoken of by the discourse analysts previously cited.

Looking for the relations of ruling: a second reading of this data

So far, the reading of this data has been ethnographic or ethnomethodological, and has stayed close to the locally produced situation of these students and teachers. In such reading, we have found much of technical interest and much explication of the everyday practice of learning
radiographic interpretation. It is one of the premises of this study that such a close look at the world of the everyday might lead us to larger, "extralocal" influences that might not otherwise be recognized in these activities. Pointing out some of these influences, based on the first, more technical reading of the data of the study, is the work of this section.

Membership

Earlier, we looked at several women's classification of themselves according to their future practice interests - whether pets, horses, farm animals, etc. - and we outlined the frequency with which such characterizations are used. These categories foreshadow involvement in intense and specialized forms of economic activity, which require the acquisition of specific cultural and intellectual capital to assure competitive success. Not only must the student interested in farm practice see to it that she intensively studies about the diseases of farm animals, but she also must acquire the ability to speak and socialize with her future clients. To some extent, her veterinary school experiences must be shaped by this future economic activity. Likewise, certain attitudes toward societal issues are presumed to go with these intentions - that is, no veterinary student who is a vegetarian is likely to be accepted into the farm animal "clique" in their class.
Thus, a complex set of economic and social relations in the larger society is connected to the membership categories commonly used by veterinary students.

Another membership category we heard about was in one woman's story of her progress from student to intern, to resident, and thence to faculty member. Although she frames this progression solely in terms of her progressive distancing from the students, it is a much more extensive set of relationships.

Any hospital, including the site of this study, is a closely controlled set of power and economic relationships. The progression from student to faculty member represents a growth in power, independence, and financial reward for the individual, and an increasing capacity on the part of that person to create economic gain for the hospital. The progression continues as faculty move from junior to senior status, and at each level they gain more presumptive ability to determine the "truth" of any particular diagnostic situation, and more responsibility for the conduct and perpetuation of the organization. So, far from these categories being a simple set of facts about length of schooling, they are instead a local token of multiple and complex forces outside of the everyday.

An elegant display of these categories at work in the everyday world is in the clothing and identification badges worn by students and faculty. In the large animal clinics, students wear blue coveralls and faculty wear brown;
nametags are worn, and are color coded to distinguish faculty from staff and students; in small animal clinics, faculty may often work in street clothes, eschewing the white lab coat required for students. In many, many ways, the economic and social categories of the larger society of medicine begin to be demonstrated in the everyday lives of these students.

Replay structures and medical conflict

In the larger society of medicine, it is a point of pride that doctors do not publicly question each other’s judgement. It could be that some of the interactions in the data, such as those that I have called replay structures, are present because of the larger, extralocal demand for a particular form of medical collegiality. One of the most appropriate ways to externalize and negotiate agreement about a medical situation is by “telling the case” - presenting all of the facts, and one’s own actions, and then engaging all present in a discussion of the case. Replay structures could be doing much the same thing, in a more compact form, in that they present past happenings in a present form and solicit the judgement of the hearer; a judgement that is presumed to be in correspondence with the narrator’s original judgement. I think that the prevalence of these structures in the narratives of these teachers and students could be consistent with the extralocal influence toward maintaining concurrence in judgement between doctors.
But to argue differently for a moment - these replay structures were only observed among women students, and they said on several occasions that the men in their groups were prone to speak in much less elaborated ways that contained less room for opposing opinions. Could replay structures be part of women's restructuring of doctor to doctor interaction? Are they involved in these students' expressions of authority? As said previously, this study's findings can only point at such questions as interesting areas for future inquiry.

Finding Normal, Finding Answers

The practice of medicine is not the joy of discovery, the leisurely inquiry into phenomena, or the rigorous search for exacting description; rather, as the data show, it is the expedient search for guidance toward a next course of action which must be timely, defensible, economically feasible, and hopefully efficacious in eliminating the problem complained of. The transcriptions in this study reveal many moments of searches bounded by such parameters - these are not the unguided inclinations of novice observers. Rather, they are the specifically formed practical actions of persons learning not only radiographic interpretation, but also the production of these objects as items of value in a capitalist economy.

These radiographs the students look at are extremely odd in one regard; they are to be interpreted according to the textual rules given to the students,
rules generated in accord with the instrumental function of the radiograph as a step in the chain from illness to paycheck. However, these teaching films are divorced from the actual process, exempted from economic meaning, but are still not to be treated as solely items of study. Students are attempting to find a way of assessing "normal" that is broader than the definition of the Ph.D anatomist, but is somehow not exactly the "normal" of the clinician judging whether or not to sell an additional intervention service to a client.

Finding answers also means that students have the burden of placing their observations into carefully worded formulas for the "radiographic report." This too, has an extralocal connection to unseen economic concerns. The purpose of the radiographic report is a) to protect the hospital in case of future question about the case and b) to provide an opportunity for generating additional revenue from the taking of the film. In the case of veterinarians in private practice, the second reason is not as important as it is in hospitals employing radiologists - but the demands of medicolegal record keeping profoundly shape the curriculum of radiologic pedagogy, as can be heard in many of the transcripted moments in the study.

It is not the purpose of this study exhaustively to analyze any of the extralocal relations identified in the data, but simply to acknowledge the interesting directions that the everyday world of these teachers and students point out.
It is repeatedly assumed, in the transcripts of looking at unknown radiographs, that there is an answer. In decades of schooling in the sciences, these students have been shaped toward believing that there is a right answer to be found in these films, and so that predilection derives from sources outside their experience with radiographs, not from it. There should have been little wonder among sociologists that medical students found it hard to deal with uncertainty, when learning objectives and multiple choice tests all mediate the learning environment toward the notion that one right answer exists.

**Extralocal forces shaping gender relations**

In our society, medicine (like law) is constructed as a neutral dispenser of wisdom and benefit, choosing neutrality because of a certain single-mindedness of purpose that excludes consideration of "extraneous" issues. Despite this alleged neutrality, military metaphors and gendered speakings abound in medicine, such as the cornerstone of a local hospital "dedicated to furthering man's relentless march against disease." The respondents to this study show a similar disposition to dispense with discussions of gender and race as "not pertinent" to the real subject, which is the "conquering" of disease.

The students at this site accept without overt questioning the goal of fitting themselves into the highly hierarchical, male-dominated structure of the
veterinary school, as well as the "malestream" of medicine itself. In this study, it was interesting to see that the women found a way to accept the validity of research in gender difference in spatial relationship perception while at the same time rejecting its implications for their own careers and their female students. It seems to me, after observing these women for many years, that something like a "willing suspension of disbelief" is required of women entering the very male domain of medicine.

In the transcript data, women may be seen attempting to work the system that they have been handed - e.g., the many times that they say "Is this what we are supposed to be seeing?" Much of the pedagogy of radiology, like all of medicine, is learning how to find the textbook, canonical answers in the body of each and every individual. Therefore, we do not know what a women's radiology might look like, or a radiology from another ethnic view, because the organizing extralocal texts have so shaped the pedagogy of this science that departures from them are not even a topic among these students.

Schooling

These students demonstrate repeatedly throughout the data that they are accomplished performers in the classroom; both in subject matter, and in their facile co-construction of the work of the classroom or small study group. But beyond that, the data shows that they have accepted some of the extralocal rationale of the organized transmission of stable knowledge through lectures
and texts, when they say such things as "well, it must just be part of the system, you know?". It is surprising that in this study, although all of the students interviewed said that they did not learn anything from the long lecture periods in the main auditorium, they all expressed faith that it must be efficacious in some unknown way.

Perils of the second reading

The difficulty in this second reading, at least for those whose bent is toward the close examination of the everyday world, is that the extralocal influences can be strongly suspected, but never directly captured and transcribed. It is that tolerance for sight that dims as a function of the distance from the transcribed or experienced that differentiates this work from pure ethnomethodology. It was part of the original goal of this study to see if, in a site that would largely be considered apolitical, there were evidences for things spoken of in feminist theory. I believe that there are such traces, although in some cases far fainter than I originally believed; and that there are good reasons to continue clearing a path from the everyday world toward theory.
Chapter 5

General Discussion

S: You takin notes?
M: mmhmm...tryin to figure out how you guys do this
S: I'm tryin to figure out how us guys do this...they all look the same to me
M. (laughter......)

Much of what I am telling you to play, and the way I am detailing it, is rather artificial - as it would be if we tried to write down the various steps of how to laugh or cry. We cannot however do very much else when teaching and learning by means of the printed page. The consolation is that the method works. Eventually, you will find the tune singing in your head and the expression coming automatically from your fingers.

Seumas MacNeill, Tutor for Piobaireachd

It is possible to use each of these sets of words to measure some of the findings of this work, and to use these quotes to frame each other. In a very real sense, the student in the first transcript, talking to me as I adjusted my recorder for the day's work, has cut through to the essence of everyday teaching and learning. Each of the participants in this study was “tryin to find out how us guys do this”. But as Seumas MacNeill (the peerless teacher of bagpipers) points out, even the best of teachers cannot account for the mystery

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mystery of learning and teaching. The entry of instructions into the learning situations of novice radiographers displays the indexicality and reflexiveness that are the foundational observations of ethnomethodology. The fact that they work, that soon the “tunes and expression” of radiographic interpretation will come easily to these students, shows the power of the relations of ruling to organize this learning through texts into compatibility with the rest of the medical world.

Methodological comments

The finding of what I have called “replay structures,” after Dorothy Smith’s description of “contrast structures” in accounts (Smith, 1993), was a very interesting moment in the study. Like many structures of accounts, once sensitized to them they seemed to appear everywhere in the interviews - and even stood out in the daily speech of coworkers and students.

I have taken the liberty of guessing at their usefulness, namely that of constructing a space in which the listener’s everyday powers of judgement and analysis may be invoked - a “fair hearing,” if you will, in which the narrator allows the listener to judge for herself. I believe that these structures deserve some study in their own right, and not as a side issue to this very different study.

I have decided, in this study, to also borrow from Dorothy Smith the idea of fully displaying data to the reader, for her use in judging my analysis or
making her own. In "K is Mentally Ill" (Smith, 1993), the interview with K is reproduced in its entirety in the front of the study; here, the complete transcriptions of all conversations from which data have been drawn for the study are reproduced in their entirety, and sequentially numbered en masse for reference purposes. In this way, two purposes of the study are accomplished; first, the data collected is made available for further conversation analysis or ethnomethodologic work, and second, the "best evidence" of the work and voices of these women are preserved and transmitted in accordance with the feminist intent of the work. In the same spirit and plan, the interview segments are reproduced without editing and as complete answers to questions. The only damage done to the interview segments is the rearrangement of complete answers into groups with other respondents to the same question. Interview respondents were invited to read the manuscript before publication, and to comment upon or correct anything in their answers. None chose to edit her responses, and all the respondents stated that they were correctly represented and expressed amazement that so many of their words had been preserved in the study. They read with great surprise the opinions of their classmates, colleagues or teachers, and were amazed at the commonalities they found. The fact that the practical, everyday act of teaching and learning is not a topic of conversation among these women is a finding to be revisited in a later section.
It took far longer to “get into” this site than I had ever dreamed, and access was gained largely in the role of ‘struggling student trying to finish dissertation’ rather than on familiarity or official position at the College. It was personally gratifying to work through many of the stages of fieldwork that I had read about, but thought that I would be able to skip - and in fact, perhaps the most rewarding moments of the study were after being accepted as a somewhat stupid, but well meaning member of one of the study groups. My own successes at interpreting a few things radiographically were celebrated by the other students, and I was occasionally placed in the role of being the one to take the films out of the envelopes and hang them on the viewers - a true mark of acceptance.

The reader has probably wondered about the absolute lack of illustrations in a work on a highly visual topic. From the early days of this study it seemed that the focus should be on the talk and the environment, and I have not regretted that decision. Many, many studies of radiographic pedagogy have focused on the visual in one form or another - for that reason alone it would be time for a purely conversational study of the action. But there is a deeper reason for this method. This study shows clearly that, whatever may be visually found by any person in the radiograph, it must enter into the world of teaching and learning (or into the world of the clinic) through talk. Whatever instruction is given, it must find its application in the construction...
of an account of the radiograph that will be seen as having been produced according to those instructions, and that seeing will be accomplished through language. It is not simply a conjurer’s trick to produce an auditory study of a visual subject; rather, it respecifies notions of visual literacy or visual pedagogy to return everyday talk to its rightful place in the enterprise.

Feminist thoughts

Radiographic interpretation could have been what Donna Haraway was thinking when she wrote of cyborg identities. The women in this study are learning to be possessed of a god-like gaze, machine assisted, which enters the world through human action. If that is true, or partially true, then this study brings into evidence one of the multiple and shifting identities of women.

It was at first surprising, and then disconcerting that the talk of these women and the men in their environment did not display the neat gender differences shown by some discourse analysts. I thought surely it would, and said so on many occasions prior to the study. I now bear the burden of explaining that failed prediction - and the explanation falls in an uncomfortable place.

It would have been extremely gratifying to “capture” gendered moments in the talk, and in so doing to have a pure illustration of sexism that would be widely hailed. I would have “come back with the goods,” proven my worth
both as researcher and friend of women, and most of all, I would have been right. I would have “fixed” something, however small, for women, and been entitled to their gratitude. This notion was based on an unrecognized image of women as always having one identity, being interacted with in one way, and playing one role. It is an image that I would have denied if confronted, but nevertheless acted upon in assuming what I would find in this study.

Instead, I feel that this study describes women in one of their numberless roles, and shows a version of interaction that is quite different from that pursued by discourse analysts. As I will speak of in the next section, it is profoundly shaped by discourses far away from the location of the talk.

There is a great difference between recognizing these influences and attitudes, and how they shaped the study, and feeling guilt or mounting apology. It was my contention in the beginning, as it is now, that men need to find ways to contribute to studies starting from women’s lives. I believe that finding those ways will entail wrong turnings that if explicated, will help create a refined methodology for men doing studies, and that clearly saying how those wrong turnings were created, revealed and amended is of use to women in ways that guilt and apology can never be.

Textually mediated discourse: the debt to Dorothy Smith

It was Dorothy Smith's contribution to sociology to say that local, everyday actions could be shaped by texts (inscriptions of many forms) originating at
great distance in time and space from the local affairs. The lives of the women in this study, both students and teachers, are organized and influenced by the canons of academia, medicine, veterinary medicine, and the North American society into which they were born. The Cartesian notions of the correspondence of reality; the idea of fixed, quantifiable measurement; the “clinical gaze” of Foucault; and thousands of other ideas that had their start far away organize the accounts of these women as they view the films on the viewers.

Women's school organization and the profession of which they are a part have a long history of male control, and are organized hierarchically. The notion of control is through all - radiographs are done only on “order” or “prescription,” and are done to “standards” through “procedure.” They are labeled with “markers” and must, at the end, become a “report.” As these women teach or learn, they do so without reaction to the textual organization of the site - but this study is limited to the demonstrated, practical actions of radiographic pedagogy. What they say, do or think about the influences on their school or their profession simply does not surface here - where or if it does surface is for another day.

Only one “difference” was noted in this study, but it is an interesting one. The instructors, both male and female, had all “heard of” studies saying that there were gender differences in spatial relationship judgement, while none of the students had heard of such studies. There is a difference in age between
the groups of about 20 years. The instructors could not recall ever actually reading such studies, and could not recall details of the “findings.” To a person, they said that they did not think of their own students in light of those “findings,” but the male instructors responding to the study said that they did believe that it was true. The female instructors said that it might or might not be true, but that IF true it was easily remedied.

It is tempting to take this finding as evidence that flawed studies of gender difference may in certain cases be consigned to memory. It is more likely that the gender shift in veterinary medicine has caused a lessening of the talk of such discouraging ‘findings’ to young women and among young men interested in the field, as opposed to what was being said 20 years ago when women were still about 5% of the veterinary profession.

**Radiologic pedagogy**

Those who teach radiology to veterinary students don’t talk about it to each other. Because they are primarily medical specialists, the meetings they attend, the journals they read, the conversations that they have in restaurants at national and international meetings are all about their medical specialties, the politics of their institutions, or their personal lives - rarely, if ever are they about the day to day practicalities of teaching radiographic interpretation.

Where, then, do they get their techniques? As has often been said around professional schools, “we teach like we were taught.” Many of the faculty
respondents to this study were quite surprised that the everyday pedagogy of radiology had become a topic for someone's research - and many ended their interview with a statement of their desire to hear what others had said.

One of the most dissonant themes in the study was the difference between how instructors view the prior preparation of the students in anatomy and how the students view their prior learning. Instructors often pointed to the year of prior work in the anatomy of the dog, cat, horse and cow as a sufficient preparation for the work of learning radiographic interpretation, that was defeated in its purpose by poor student recollection and review, or by a tendency on the part of the student to "study to the test." In explaining their position, instructors would often refer to the skeletons and radiographs available to the students in their first year, and to the boxes of dry bone specimens provided to all first year students.

Students, however, said that they never had any orientation to the radiographs, and were encouraged by the circumstances of the lab to simply memorize labeled points for the test. They said that the dissection of cadavers in the laboratory never revealed the bones in a way that would be useful in thinking about the view given by the penetrating x-rays. Never, though, did the students take issue with the idea of learning anatomy to help interpret radiographs - they simply gave accounts that demonstrated why it had not, in fact, happened that way.
In watching laboratory sessions and instructed groups, especially as the study went on and the issue of "what is normal?" became so paramount in my thinking, I began to be aware that instructors did not often say out loud what made them think a certain area was normal - their descriptions and pointings were almost exclusively of and to the abnormal. Note the amount of abnormal description versus normal in this transcript:

S1: Collapsed lung?
T: Yes, collapsed.
S1: where?
T: Well, you ( ) yeah and normally you should extend up to here ok? and at the level of the first rib ok so they are really retracted and so partially collapsed

S1: /uhhhh hhh I dont follow im sorry
T: / ok NORMally tha cranial lung lobes go up to the first inter costal space
S1: yeah yeah yeah
T: /ok so now the edge is right there so you know that they are retracted

S1: /oh wow
T: /ok so
S2: /now theyre pushed like that
T: /yeahpush pushed like
S1: S2: oh oh oh it
T: /so theres less extension than normally
S2: /so this . this is .
T: /these are all lung lobes
S2: oh wow
T: the different segments of the lung lobes
S2: huh.. ... huh yeah..collapsed..now wheres the middle right on here
T: /partially collapsed
T: yeah we dont see it very well, its probably this one the faint one you can
see its a little bit more lucent there..thats probably it so theres not much air in
it so that why we dont see it
S2: why would you not say that you would suspect fluid more so here on
the card you say
you suspect it more here versus the other lobes but i would think this is completely
covered
T: /yeah
S2: /or completely filled
T: /because its down, yeah definit
S2: /so if its just fluid
laying on top its not in
T: /on the top
S2: /ok

The ratio is about two lines of description of normal to about 30 lines of abnormal structure discussion. Some instructors said that they specifically never use normal films in teaching, because “normals get boring”; however, in my participation in student laboratories, expressions of a desire to see normal films for comparison were the most prevalent unfulfilled wishes. One male instructor in a laboratory almost shouted out at a group of women students “ IF ITS NORMAL DON’T TALK ABOUT IT” - all of these things are evidence, in my mind, that the explication of “normal” by instructors is almost unknown, but greatly desired by students. Coming back to Dorothy Smith’s contrast structures, accounts of deviation from normality are usually accomplished by making contrasts evident. In the case of radiographic pedagogy, the contrasts are largely assumed to be derived, not explicated. Expert radiologists that I sat with actually used the body itself as its own
normal, in that they would look at the contrast between the same bone on opposite sides of the body to make a determination of difference. Though I have seen experts do this on countless occasions, I have not yet heard that technique recommended to a student.

A puzzling finding is the absence, in student work, of the “hot light” or other forms of manipulating the visual field in order to see some structures better. I have asked a number of instructors why this is so, and the primary reaction is puzzlement - as if it never occurred to them to think about teaching those things to students. On the other hand, first-year radiology residents aren’t taught the use of the “hot light” - it is assumed that they already know to use it. A tempting explanation is that such techniques are “too much” for the novice, who already has too much to learn. However, instructors admit that some things that students are required to see and comment on would be much easier seen with a spotlight. Why this spotlight, which is an everyday part of radiographic interpretation, is not also part of the student’s world is a mystery to the students, to the instructors, and to me.

Teaching to learn, learning to teach

As these women sit in the lecture hall, watch over the shoulder of their radiology teachers, or sit together practicing the interpretation of teaching films, they are using a lifetime of native skills in putting indefinite
instructions conveyed in talk into practice, in local situations shaped by the talk. At the same time, like their instructors before them, they are acquiring the instructions on how to teach radiographic interpretation along with the instructions on interpretation itself.

Teachers and students alike are engaged in manipulating canonical accounts of the body, of medicine, and of the course of the adequate formation of accounts that were produced far from their local situation into instructions that recognizably fit their current circumstance. In that work, they reproduce some of the commonly identified features of classroom interaction, with instructors expecting certain responses because of their "ex-student" status, and students reinforcing notions of "teaching" that they will reproduce in future years.

**Implications, future work**

Can it be said that this study is generalizable? Certainly the socially constructed medical school environment, the profession itself, the students and teachers, are all part of what Dorothy Smith would call a textually mediated environment, mediated by common texts enshrining common paradigms. In that sense, and in no other, this study's findings would seem to hold reasonable interest as sensitizing concepts for further studies of similar sites.
For the women involved in this study, and possibly for others who read it, the study provided a meeting-ground for discussions that would not have taken place without it. It exposed the respondents, for the first time in their lives, to the concept of studying women's teaching and learning in itself, and not as a contrast half to the study of men's teaching and learning. For the radiology instructors, both men and women, the study opened up a new conversation about practical, everyday pedagogy that did not exist previously at this site.

A few very concrete discoveries were made; replay structures, pitfalls for men researching women's lives, the differing views of prior learning between student and teacher, the lack of explication of normality; and each holds interest for further study. The literature review alone has pointed the way toward more studies in medicine that search from the lives of women and minorities, from phenomenological and technical rather than from theoretical viewpoints, and that seek to explicate the extra-local relations of ruling that enter into practical pedagogy.

But these discoveries and promises pale beside the standing miracle that was observed in this study; that in some way, still truly known only to those clustered around a 14x17 inch lighted box peering intently at shadows, these women manage to turn words and sight into healing - a latter-day alchemy that only a fool would claim to understand.
Appendix A

Interviews and Transcripts

Teacher (Segment 1)

Q-1 A lot of it is instructor dependent. So, your ability to learn or not to learn radiology does depend upon the person who teaches it to you. If everybody was taught by the same person, then you would be able to gauge,...is there a variation in people’s learning ability. But because it is so heavily dependent upon the person who teaches it to you, there is another factor that goes in there.

Q-2 It is the way that the information is transferred from the instructor to the student. What kind of impressions are developed in the student’s mind as the instructor is talking. So, probably the best way for me to describe it,.....they say that you have to have a good imagination to be a good radiologist, but before you can have......if you were a blind person and somebody was trying to describe “red” to you it is different as if once you had been able to see and knew what red was.

Q-3 There is, of course, those people who have easier comprehension of any topic; in that if it is presented in a way .....you can have one instructor who is very minable in their abilities to explain things, and you are always going to have X-percentage that will still understand. Maybe it is through previous experience, maybe it is the fact that they naturally understand. The better the instructor, the higher the percentage is going to be of people who understand it in a reasonable period of time, and notice that I didn’t say the first time, but in a reasonable period of time. This is also diverging just a little bit, but realizing that when you are discussing radiology, you are not just talking about the medical applications of using a radiograph to diagnose something, but it is starting with the primordial understanding of basic physics, and realizing that there are many people, no matter how intelligent they are, automatically have a fear of the discussion of physics.
Q-4 I would say that most students don't have a fear of me, but yet there are instructors whose students have a fear of.

Q-5 We have to put this on two levels. There are students who may have an apprehension about me because I am an African-American. If they don't have an apprehension because of that or if they have gotten past that, it is probably because of two things: One, I try to...when I am teaching them in front of an audience, I try to put myself in such a position where they see...(a) I seriously want to teach them, and (b) I am not afraid to do something that is totally silly, crazy, off-hand in order to attract their attention and gain their appreciation of the topic.

An example of what I am talking about there, ...last year, I was discussing how photons hit something, and depending on what the energy is they hit softly or they hit hard. And I went down on the stage, I hit hard, I did it on purpose......it caught all of their attention and what-not, they first thought that I had passed out, but when I got up and continued talking without a skip, they realized, ..."Hey, this guy is willing to do crazy things,...." so they're all willing to come and talk to me. Now, even then, I can tell you that there are a few students who were turned off by that.

No single instructor can be the perfect instructor for everybody.

Q-6 Yes, definitely. Unless they have a natural aptitude where they can sit down and read, they have to be able to go to an instructor or somebody where they can discuss that, and I could give you names of certain people who are in that situation, who, yes because they are afraid to go and get a clarification of something, is always going to leave a questions there.

Q-7 You always try to leave a situation so that that student (a) feel that they do have an opportunity to ask questions, so it does not.......you try to make it so that they feel comfortable asking that question, or you try to cover what you feel are the complicated topics in at least three different ways, so that hopefully one of those ways is going to be the way that that person will comprehend it.

Q-8 I understand what you are saying. Some of them do find that.

Q-9 I can imagine there being a difference in the way that the topic is being discussed, but I think that may not be so much as a particular gender based difference, as a developmental difference in their environment. I am trying to put it in a way that it won't be sexist, but this is the best stereotype I can think of that's going to........"Hey!.....(clap! clap!) that will work, if we have the typical stereotype of the male who is the auto mechanic type, and a typical stereotype of a woman who has had home economics, I don't think that's stereotyping I am just using that, the guy, if you are talking about power, energy,......you will want to talk about horse power. The woman, if you want to talk about power or energy, ......you might use stove or ....in other words you have to talk what they have had experience with. But, the reason that I say that is, I know women who are auto mechanics and don't know the front end of a stove. So therefore, those women, you would want to talk about
horse power. And at the same time, I know some chefs here in town, who
probably don’t know the first thing about a car. And the chefs may be men or
women.
Q-10 What you are asking there, in what I did as growing up, it gave me a
good understanding of mechanics, and the body is a machine. So, in how
things work, in many cases, I was able to utilize biomechanics due to what I
had done in artificial situations. But, once again, there are a lot of things I
can help you apply real life experiences to.
Q-11 I think that going from two to three-D is another variable that is
individual. Yes, it is going to be hard for students as something that they
have to learn. And not every student or every individual can do it. That is
an intricate part of the brain. Okay? So there are some people who just
cannot think in three-D, but that is not a sex related basis. That is individual.
Q-12 Yes. You can train them enough so that they can look at a radiograph
and say, “Well, this is what I think is going on,”. Now as to whether they
will be a radiologist, that’s another story, but I am never going to be a surgeon.
I think that there are a lot of surgeons who can’t think in three-D.
Q-13 I think that for the most part, a radiologist is going to be somebody who
is very inquisitive,
and is multi-faceted in their interests. Because radiology is not just radiology.
Radiology encompasses all of the aspects of medicine. You have to know
some surgery, you don’t have to do it, but you have to know aspects about
surgery, you have to know good amounts of medicine, You have to know
your anatomy backwards and forwards.
Q-14 Yes. Radiology forced me to (a) re-learn my anatomy and (b) learn my
anatomy better, and everyday when I practice radiology , I am running back to
the anatomy books.
Q-15 The first thing that it does, and I started off saying, they have to
know some basic physics in order to understand radiographs, ....Part of that
basic physics is the affect of continuation of photons, in other words, how
does a bone look on a radiograph, how much photons are accumulated by
bone, metal, soft tissue, fat..........after you have spoken about how that does,
throw them into a situation where they have to start deciding what is it that
they are looking at. Because like, if every time, if you are there, telling them
what they are seeing each time, they don’t really see it. So you have to put
them in the situation where they are telling themselves what they are seeing,
even if what they are seeing is wrong. Because they have to make a
commitment. After they have made a commitment, you can then go back
and question them as to what they saw, and even if they were to lie to you
about it was, “Yeah, I saw that”, they can’t lie to themselves. So then after you
are through talking to them, they will go back, look at it again and say “Yeah, I
knew that was there.”, and it is then driven into their minds.
Q-16 Because in all educational situations, once again , you are going to
think more about a situation if you can have somebody that you can talk it
over with, and by sending them off with other students versus an instructor, once again you are forcing them to commit themselves, even among their peer-group, they can talk it over, they can come to some rationalization, they can see just what is my understanding of this topic. Then when they come back to you, they all find out if their understanding is as good as it was. If you are never challenged, you never really get to the depth of what your knowledge is.

Q-17 It totally depends on, let's say the culturally different individual. It totally is different for that individual. Imagine one American in a European school. So they are a minority from the fact that they are from America, but they can still be caucasian. The reason why it can make a difference is sort of like, ...we were talking about it...are they afraid to ask questions, how about working in groups.....if they do not feel comfortable working with the group, they are going to be left out in the cold. So, in our situation here, if you have a minority and that minority does not feel comfortable working with the group,.....and it may not have anything to do with the group,....they may welcome the individual, if that individual wanted to participate. So, so I'm not putting anything against it, or saying that the group is turning them away, but if that minority does not feel comfortable working with that group they are going to lose out on the peer level discussion which is going to take place.

Q-18 In some cases, they actually told me. In a couple of cases, I had it come back to me through other channels. And in a couple of cases, it showed up on the evaluation sheet at the end of the term.

Q-19 Just realize that there is nothing that you can do about it.

Q-20 Perseverance! I really am serious when I say that, it is instructor dependent.

Q-21 U.V. Mavstafski. (Isn't it interesting, a radiologist with the initials U. V.?) Mavstafski could be one of the most boring people in the world. That is not what sticks out. The reason why Mav had such impact is, If you sat there and truly listened to him, and did the things that he told you to do, the point of what he was talking about would be rammed home. He would say, like if you wanted to know what the interaction of a photon was he would sit there and he would talk, he would talk for an hour, but he would also tell you how to go and run some simple experiments so you could see. Like, take some bone, take some mortar, take some gas and see what is going to happen, how it scatters and what-not, and if you illuminated all of the fluff, there was a banquet of information inside there. Now, I am trying to think of who else......my experience is probably a little different than,......there are a lot of people who would not have become radiologists, the way that I did it. Because it was sort of random, hap-hazard, and a lot of self direction. Whereas a lot of people would not have survived that way. But I am just one individual.

Q-22 There are standards,.....for example a heart,.....it should be three costal spaces wide, it should be at a sloping angle to the trachea, should not be too
much sternal contact, so those are standard things. There are things that we have incorporated that say that these are within the normal range, however that sometimes lulls us into a sense of false security. So, we look at things, and we say that this is within the normal range and if we do not also say to ourselves, but not every animal is going to show the abnormal appearances, .....we will miss a lot of things. I think, from my experience, ten to twenty-five percent of abnormal cases show up as normal.

Q-23 You don’t. You can’t. There is too much information for them to digest. So there are different levels of teaching. And I am just going to put it a student level, a senior level, an intern, resident, not radiology, level and a radiology resident level and then a radiologist level. Each one of those has to have a different understanding. A student needs to know that this is the normal for this animal. I didn’t say normal range. This is the normal. And then, yes, we have a range. If it looks like this, it is considered normal. Move on to the next. Don’t think about the fact that there’s twenty-five percent of those which are going to be misleading. But what you do say is:”this looks normal to me, however this animal is having signs that is compatible with problems in this area, I need to send this off to a radiologist and get their opinion.”

Q-24 Yes. There is a system. You have to have a system. But your system can be totally hap-hazard to everybody else. You don’t have to use the S, you don’t have to use the Z, you don’t have to use the concentric circles,.....I tell the students this all of the time. “I don’t care what your system is,......just have a system, and use it. So whatever is comfortable for that individual.

Q-25 It’s in the book. I would read something and I’d say, “let me try this”, and whatever it comes down to now, I don’t know...... I just know that I do look at everything basically the same way.

Q-26 Throwing too much information at the student at one time. But that’s the problem with the way that we teach medicine and x-rays, we throw too much information at the students at one time which prevents them from learning.

Q-27 There is a different way. ....I will give you my example of too much information.....We tell the student that we want them to know all the different reasons as to why this animal may have hepatomegaly. And we want them to be able to (snap! snap!) reel it off, and you know what we may give them in their notes?....One hundred and ten different things that may cause hepatomegaly.

And I think that is a bunch of bull-shit. First of all, anything past number ten hasn’t been seen since the Bubonic Plague was cured in Europe. Second of all, they don’t need to know that. In this day of the information age, they need to be able to recognize the fact that the animal HAS hepatomegaly. They need to be able to pull in all of the aspects of what’s happened to that animal and then put it together in a way that it then can be assimilated. So, I teach students that, “I don’t care if you can tell me the one hundred and ten ways
that this animal has hepatomegaly, I do care if you can tell me that this animal has hepatomegaly.” Why? Because if you can tell me that this animal has hepatomegaly, you can go to a book, you can look up hepatomegaly and then you can go down and find everything that the book lists as to what its causes are. But if you can’t tell me that it has hepatomegaly, doesn’t matter how many books you have, they are all worthless. And it comes down to, I try to teach categories instead of individual items. So, another example is pulmonary infiltrate. I love it because cardiologists teach that pulmonary infiltrate is pulmonary edema, and internists may teach that pulmonary infiltrate is infection, and the pathologist will tell you that pulmonary infiltrate is post mortem, or whatever, it can mean all different things to different people. I, as a radiologist want to teach that that’s pulmonary infiltrate, and depending on what other things are wrong with that animal, I cannot tell you what it is due to. But these are all the differentials that you can find in the book. Now, if you tell me that this animal is a cardiac patient, it is probably edema, but what can we do to rule that in or rule that out? Just because it has pulmonary infiltrate and is a cardiac patient doesn’t mean that it is edema. And if that is where you go, you immediately go to the bottom of the list because you are missing all of the things on the top of the list. Best example is pulmonary infiltrate in an animal, and you are going to treat it as a cardiac case and finally get that cleared up and realize “Oh, this animal has lymphosarcoma.” So, you spend all the people’s money treating a cardiac case and the animal dies from lymphosarcoma.

Q-28 People want answers. And when they use specialists, they expect that specialist to give them answers. Now they know that we are not God, and if you just come out and say, “Well, this is what I think it is, “.....or this is how I would go about ( ) things in and out, that many times, they will accept. You know, a lot of times when I am called into a practice it is because people want a definitive answer. “We’ll call God and he will be here at two o’clock.”

Teacher (Segment 2)

I don’t know that it was time specifically allotted to learn to read radiographs, but I remember learning to read radiographs.

I think I remember that the tendency was when first looking at films, to focus in on too much detail. to try and run borders of bones, looking for a lump or a bump, and you’d find many that you didn’t know whether they were real or not. and looking at too much detail. and also being unfamiliar with the anatomy of the views, and struggling with you know, what is this? you know...and what anatomical parts are they, and naming them. and those are
the two things that initially I think take so long for a person...it takes a long time for a new person...a newcomer at this ...to look at a film. Give them one film, and they’ll spend 20 minutes on it. I think that’s what they’re doing...they’re running borders, you know, trying to look at every possible little area on the thing in a systematic fashion.

I think that first of all you do get...that practice does get you there. ok. plus a knowledge base on the anatomy. so i think for starters I no longer struggle with anatomy. When a radiograph goes up, I instantly know what it should look like. ok. so I have a data bank, somewhere in my brain, that says what the DPL low view of an equine carpus is going to look like. As soon as I see it, there are instantly things that will jump out at me as not being right. so I do think that a training program to ...where your brain sees a lot of normals, and categorizes that away...that any thing that isnt in that grouping does stand out. And I think it’s an instant thing...the second you put the film up.

I think that also, with practice, you can take a look at it from ...you tend to look from farther away, not nearer. You tend to be much less of a detail person. You tend to stand back and look for shapes of changes or fragments or rough borders that stand out of the ordinary and you tend to go to look for those rather than following it not knowing its out of the ordinary and following the edge, and hoping you find something that didn’t look smooth, and then stand back and think now, is that abnormal. Its the exact opposite. you see everything instantly registers as normal if it is, and if its not it catches your attention and you tend to go to it.

Were you a natural?

No, I don’t think so.

Is there such a thing?

That’s a tough question and I don’t know that I know the answer to it. I do think that certain people that um...I don’t know what it is ..huh.. whether they’re brighter, whether they may have studied harder, or what it is, but they seem to come in more prepared to handle the task of reading the radiograph than others. But I don’t know that they didn’t just train themselves to be that way. Some of the students don’t know the anatomy at all. and you put it up there, and they’re struggling to tell you that its a hock joint. or they’re struggling to tell you even “the carpus”. And they’re trying to find bones and they can’t remember the names of any of them. So those people are at a disadvantage, than the student that does know the anatomy and as soon as you put it up there does recognize it as the carpus, could name you all the bones, well that person may just be more studied. It may not be a natural
talent. But it puts them a stepping stone ahead in reading films. And maybe its that I have not - i don't know - i guess I can't say that I've seen somebody that I thought without any training whatsoever without extra studying on anatomy or anything was better than somebody else at reading radiographs. I couldn't say that. I think that there are definitely better students that read radiographs quicker, faster, and find the lesions easier. But I don't know that thats not training and hard work on their part.

women reading rads....

I've never heard that. And I've never personally felt that. Course, I'm probably of the biased party.

teaching methods 3-d

I think that two key things help with that. One is to bring out a specimen. That, to me, has been the most helpful thing. And we did it just today. You go get the bone, an actual model of it, and you show them "look, here it is". Now tilt it and look at it as 2D and tell me what you see and they go "my God, its the same thing as the radiograph". And so sometimes, for the first time, they're able to take a 3D to a 2D. I almost think that is harder than taking a 2D to a 3D. Inotherwords, they're seeing a three dimensional like you're describing to them, that you're taking a view thats an oblique view, and I'm going "ok you see you're going through like this, its oblique" but they don't see it from that perspective as 2 dimensional, and that's how its showing up on the film as only 2D. So taking that specimen and saying "now, stand back - block it out - and what I'm going to do is I'm gonna make it so you can't see the specimen 3D- and what do you see? and that's when all of a sudden you see just the 2 dimensions. And they actually, what I have found is that going from the 3D to the 2D teaching them how to do that and how to use the specimen to help them see that has been a big help for them. And then they can do it on their own leg. That's the second thing I always teach them. And then that ..they may have to stop a second, and do it themselves on their own leg and say "ok, i'm going to bend my leg, and pretend i'm shooting a beam from here to here (demonstrating on her own leg) and now i'm going to pretend i'm standing here and looking at it as a two dimension. And then they can tell that "oh yeah, look at that, its gonna highlight the front right here, and then coming from a lateral view...." and so I teach them to go from the specimen that looks exactly like what they're looking at to some known fixture body part that will always be with them - so whether they're looking at a carpus, or they're looking at a hock, or whatever, that they can then convert that to their own joint and then use that in thinking about it ...how, how it would appear as a two dimension.
Well, that’s true. It’s something that I don’t even stop to think about. But you’ll sit there explaining until you’re blue in the face until you relate it to something - it’s like taking a little kid and putting a ring on one of its’ fingers and telling them “the one with the ring is the left”. And then they can go on and ...I mean, otherwise, you’ll be sitting there going “left...right ..left...right” and they can never get it straight. Until you tag something, that they can then relate to forever, so thats what I try to do is get them to tag a joint so that then they can stop...there’s all this confusion ...there’s fronts, backs, 60 million bones, what joint is this and they’re like....so then you just say “Look...use the labels..you know how to use the labels to tell you what view they did...then take that view and just stop and think, ok? (demonstrates on own knee..) that’s gotta be the medial side on the front on that radiograph. And then once they usually get it, then they can get everything else. But once they get the spatial relationships, they can get everything else.

(student who just cant)

No. I’ve never seen that. I’ve seen plenty that you put up radiograph after radiograph and they are clueless. They can’t tell you one thing. And you even tell them...and you go back up and ask them and they can’t remember. But, they can’t remember anything. They can’t remember the anatomy, they don’t remember the names of the views, I mean they don’t seem to remember anything, and I think that they’re just not applying themselves and I think they’re not studying, and that type of thing . I don’t know..I guess I don’t know that I’ve met anybody that really I thought studied and tried to learn and put in that time and then couldn’t do it. I’ve never met anybody like that.

(Iconics)

I don’t pretend to know the answer, but I’ll throw out the first thing that comes into my head. It is a hard copy representation of how the doctor sees the inside of the patient. Meaning, that’s what we’re supposed to do...as doctors...is be able to see the insides. When there’s something wrong with the way the body’s operating, we’re supposed to find out what that is internally. And it is the ultimate hard copy, or one of the only actual ..here is something and ..look, you can see the inside of the problem and so its something that’s photographic because of that. I mean looking at lab data, which is to look at the inside, doing a thorough physical exam, doing a good rectal exam, all of these things are to achieve that same thing, but they don’t have nice, pretty hard copy to go with it.

(What do you want to know?)
In terms of what...my selfish perspective first, in terms of what would I want to know, as a teacher that of course doesn’t have a lot of time to develop my teaching, is I would love to hear the tricks of the trade from others. Because everyone has developed some way that they think “well, you know what, when I started doing this, they really got it”...and a lot of people have those little things ..and yet, I may not have thought of it or may not have taken the time to do it, and yet if somebody told me “well, jeez, when I did this they just got it”...and then, I might do it. I can think of examples where people said “well, this was a really good example and when I did this example they understood it..it was an analogy” and so I would start using that. So I think that ..tricks of the trade of people that are experienced teachers and that have had to do this...like you’re doing, and gathering information from people that have done it , I think...and then distributing that to others...so that they then would try some of that themselves and see if it helps...would be a big plus.

Now the how to...I somewhat question the premise, I guess. In that, I wonder if everyone’s mind really does work the same...meaning, I don’t know if how I trained myself to start finally “getting it” on reading a radiograph is gonna be the same as somebody else’s mind. I do think there’s certain things you have to get, you have to learn the anatomy, I think you have to ..you start to become familiar with it, I think you first ..you do where you’re too myopic, and then you can finally stand back, and there’s a certain familiarity, but ..much more detail beyond that ..I don’t know if the minds work the same. Maybe they do, and maybe you’ll find that out.

(dog heart conversation)
Right, they’re looking for way too much.

Well, I think confidence is a big factor. Absolutely. Meaning, at first you have no confidence, you don’t think you’re capable of identifying the abnormalities from the normal. And so, you even doubt yourself. OK, let alone saying it. As soon as you see something, and you think “well jeez, I wonder if this is a big heart”, you even doubt if it is a big heart. You doubt your actual observation. So let alone that you’re gonna stick your neck out there, you even doubt whether its true in the first place.

(hurts students? do those with more bravery have an advantage?)

I think it depends on the teacher. And what I think there is that if its a fairly low word...minimal word teacher, that isn’t talking a lot, and extracting information from them, then those people will fare better. Because I think, they’re bolder, they’re more likely to make their statement, they’re more likely to make an answer and the other people will sit back and be afraid to say anything. And I’ve noticed, even in my own...I think I tend to be a fairly verbal teacher...I think I tend to talk a lot, I’ll work them through things, and I
notice on days that I’m tired, and I do less of that, the dominant student
always takes over. If you...so I think that the more active you are in a role of
extracting information, the more they feel more relaxed in being able to say
something and not have it be accurate, correct, whatever and you get them
the feeling that talking and saying what they’re thinking is ok. Talking and
saying what they’re thinking is actually ok and if it’s not right we just say
“well, that was warm” but its not accurate, but give me a little more...think
about this,...what about position...you can say a lot of things that make them
feel like they weren’t really wrong, and that they were somewhat close, and
they’ll keep going with that thought...and they’ll get there. And then you’ll
notice that the whole group gets talking. And so I ..yeah..dominant students
with more confidence...even if they’re wrong and don’t know it....or it doesn’t
matter to them....or they’ll be saying “ I was right anyway“. ...I mean , there are
students who are like that. They will dominate a teaching situation I think, if
the teacher’s not interactive. And then as long as the teacher’s interactive, I
think even those with less confidence will pipe up.

Doing surgery...and seeing when you are wrong...and ..here comes my big,
biased statement that the radiologists will kill me for
saying....but...radiologists never get to find out when they were wrong. They
call lesions, but they never...unless the surgeon comes back and says ”you
know what, that lesion was...whatever” and even then, you’re telling it to
somebody that didn’t actually live it and see it. ..... Even subtly different..ok
...meaning, you might know that yeah, that lesion was there, but I’ll get in
there and I’ll go “you know why that lesion looked a little bit like it might
have been on the other side of that joint when it was actually lateral? Cause it
was on the axial border! I understand that now”....ok, and that’s something
that you would never bother to go back and tell a radiologist. Because it’s not
like they were wrong, it wasn’t like it was off, but you know , you’re in there
making this discussion about how on this oblique it looked like possibly the
fragment wasn’t off the lateral and then seeing them on the AP view it
obviously was, and so they called it a lateral eminence fragment, but you sit
there and you go “this view almost makes it look like it’s come off the medial
side” and then I’m faced, as a surgeon, with trying to decide how to make my
approach...see I have to commit. And so , I might say, well ...and a couple of
times I was wrong...and the radiologists were actually flat out
wrong....meaning I was wrong and they were wrong...in calling it off the
screen. And when I went in on that side, it wasn’t there, and of course you
look around and go “my gosh, this thing was just off midline, but on the axial
side, I see why now it looked like that on the film“....but I actually lived it,
and saw it, and went in and got it, and then you can go back and explain that
to someone, but its like, again looking at something two dimensional rather
than three dimensional. Another big place I’ve seen that is on radiographs
that have a lot of ridges, like that, this up and down business. And so
fragments that might be on an axial border of a ridge, on different views, they look like they’re centrally located. And so, I’ve learned a lot, I think, in my 3D analogy of films, from making the call on 2D pictures, but then getting to go in and see it 3D. And learning where it precisely is, so I think surgeons have some advantage in that. And I think it helps a lot. Another thing interesting...your comment about women really intrigues me, because it’s the first time I’ve ever heard that...ever. Now that’s not the first time I’ve heard about the spatial orientation, and I think actually, on different tests, when they do those spatial orientation tests that that’s true, but I’ve never heard that in terms of reading radiographs. And...it might be true. I think that part of the reason that maybe I...had not recognized it is the women that I work with...may have been preselected. Usually most people don’t go into either surgery or radiology unless they’re not struggling with it. And I think if you had a natural...less of an ease, I should say, of being able to picture things in 3D or whatever, that wasn’t as easy for you, I don’t know that you’d necessarily gravitate to radiology or to surgery for that matter, because both of those require a lot of that type of work. But I would probably say, just in terms of spatial relations, I know what all my scores were on spatial relations in high school...and I was definitely better than average, but not 99 percentile. But in certain other things, that I think also relate to reading radiographs, like either mechanical ability, and some other things, I think people can compensate for that a little bit. But, I think that there are other things about the what I do and the way I learn that make up for some of that. I think I’ve learned to cheat, is the best way for me to put it. I mean if I start to have trouble with the spatial relationships, I’ve taught myself...because I know when I start to think that...“wait a minute”...and then I’ll just stop...and this is where the learning comes in...where maybe students are not as natural...that I think you need to teach yourself how to..visual landmarks..get yourself oriented...because as soon as that happens, you’re ok. Like the knee thing...and maybe that’s why I came up with that..maybe I don’t have as good a spatial relations as other people. And so I do think that maybe students that have a little bit tougher time need to spend a little time learning how to get their landmarks, and just even if it takes memorizing something at first, so then you can get that, and then it will trigger, and you’ll be ok.

Oh, it doesn’t surprise me that it was said. And they say that those are reasons why women aren’t mechanical engineers, and women aren’t architects, and women aren’t all these things, and I don’t know...certainly the people I know don’t have a problem with it, but then they are those things! And so therefore, they may not have had trouble with it, and so they got selected in. If you were to look at the population overall, on the average, maybe it would pan out that there was more trouble.
But I think that people learn to compensate for those things. Let's say you DO have a little bit harder time with that. I think that because that person has lived with that deficit their whole lives, or whatever you want to call it, they learn how to cheat. There's no question that I do that.

(learning to tell time story)

And I memorized it ... and then I gained the confidence that I could get the answer ... and the stress would be relieved.... and then eventually I actually understood it so that I could think it out and didn't have to just memorize it. And I think that there's some of that in reading radiographs... probably more in some people than in others, again depending on how they learn. ... but there comes a point where you have to memorize the bone, you have to memorize a few key things about the views and what it's gonna highlight... and you have to just commit that to memory... and then you can begin twisting that and understanding the little subtleties.... and I think the students that don't do well... that you get up there because they haven't taken the effort that it takes to get through some of that just simple memorizing... and they just haven't bothered to do that... so now they're behind the 8 ball, and I think that they have more of a hard time and they can't come up with any of the answers let alone even what the bones are... and the students that got that groundwork, and memorized the bones, and learned that, they at least know that they can get that far. Then that gives them a little bit of confidence and they can spend their time looking at the other things.

Q. I can see why that is, because it's all so new that the dissection is new. Okay? And so therefore, their minds, I think when they start doing the dissection is, "okay this muscle, yeah, look at that, that is the greater..." They're not thinking of it in terms of the 3-D image of the radiograph, because they're still just trying to get through what's in the dissection. I think that's an advanced learning technique. I think that that comes after you've been through that and your mind has gotten used to those things, and heck, that's what I'm learning. I'm still learning that everyday. That's the amalgamation of those two learning steps. Maybe some students are advanced enough that they do get there, in the years that they learn that. They do even finally get to that point maybe in their junior year. Some people theorized that that's the time you should be doing this.

If I had the working capital for a course initiation it would be a junior surgery anatomy course that incorporated those three things, (incorporated pre-performed dissections with radiographs with ............... ) They would walk from station to station; it takes an incredible amount of work because you have to (______) to find the exact radiographs and try to show them some of
these exact things and maybe at that point in their career, they could begin that amalgamation.

Q But, that is a good point. What I mean is that I don’t know whether you could do it say, to (compensate) your surgery (they wouldn’t have a clue). They wouldn’t know where you’d make the incision, they wouldn’t be able to take themselves through that, but there’s no reason why we couldn’t ask them to take themselves through more simple steps. They stand there and you go, “Bandage the leg.”----and they don’t even know to pick up the (combine). First you have to actually unwrap the (combine) and then you have to( tape the coin ). And that is a good point, I think that actually that could be incorporated very quickly for example. Right here is something you just triggered that would be very simple to do.

The night before we go on rounds, I always start about four o’clock and we go through cases for an hour at least, like you saw. Here is something that could be very simply added, you go up to the books and find out what cases are coming in tomorrow, (chronic lameness, right front, etc.) You assign the student one of these, and you say, “Okay, tonight when you go home, this horse is going to be a chronic right front lameness, this has already been worked out. It’s thought to be an ankle problem. Tonight, I want you to mentally go through,”...because they’ve already been taught, they’ve already had their course lecture on how to work up a lameness......“and so tonight you’re going to mentally take yourself through the steps.” Basically, what we do is we ask them that, but just like that ( ) we walk out back and it’s, “Okay, what do you want to do next?” And they haven’t been stimulated to work themselves through it. They don’t. They go in cold. It’s amazing to me that a student (and this is that they know they were assigned the case the day before) they know that it’s going for a hock arthroscopy the next day; they don’t go look it up. They don’t even think mentally about that you’re going to go into the front of the hock or the back of the hock even though they know that there’s a fragment, they already went through the radiographs the day before. They know the fragment is in front of the hock but they don’t even stop to think. You catch them right off guard. “Wait a minute, where am I going to make this incision?”...and you turn to the student and they go blank. And they can’t even tell you whether you’re going to go into the front or the back. And so you’re right, they have not learned how, or even thought about, how to mentally work themselves through a test.

Teacher (Segment 3)

Q-1 The big problem is that they perceive a lot of light coming through from the viewer that strikes their eyes and they bounce around and they don’t really know what to zero in on or how to organize their thoughts. You could
ask them to look at a film and tell you what they see and they might say they see a heart and they see the spine....they see things that bounce to the retina which are mostly light transmitted areas. The animal has a gunshot wound, they’ll see the pellet. They’ll see the bullets, they’ll see a plate on the leg; they see the bright things first. They bounce around over the film.

What they lack is organization in their thought patterns. That’s where the radiologist needs to assist them in an organized fashion in the reading of a film because a radiologist might just do this, might bounce around over the film because he’s quickly screening. He may start at the center and work out; he might start at one system and work through the other systems but his mind is working in an organized fashion, where the student has not the ability, (at that point that they first begin) to have any organization.

So, I think our first suggestion to them is how to begin to organize their thoughts; where to start, rather than, “What do you see on this film?” If you ask them, “What do you see on this film?”, it will probably take them all day to tell you everything they see on the film because they don’t know what to look for. They may know anatomy but anatomy is only helping them if they know how that relates to the problem of this animal. After you get through directing them in an organized fashion, they can tell you what looks normal, what looks abnormal, how does this relate to the problems of this particular patient? Why are we evaluating this patient? Just to find out he’s got ribs and he’s got a diaphragm and he’s got a liver? There’s got to be a reason why all of this came about. It really takes some steps in learning interpretation. You just can’t go in and in thirty minutes you’ve got a student developed into a diagnostician.

Q-2 The first things are the major items, they see the heart, they see the liver, they see the diaphragm, they see the trachea, they see the things that really stand out and bounce off. That is kind of the basic concepts that they are picking up. As they develop in their skills, they are able to get relational problems solved. In other words, that stomach is displaced; it is no longer where it belongs. It is being pushed back. We know that the liver is in front of the stomach so, “What does this mean to you?” Well, now we’ve got an enlarged liver that is related to this other problem. In other words, there are relational changes that go on. Not only do you see a stomach that isn’t in the right place. If it is not in the right place, why isn’t it? An organ is not the right size, why isn’t it? An organ is not marginated properly; it has bulges, it has bumps, it has irregularities. There may be differences in, what we call subject density. The radiograph will show essentially four biologic densities: the gas, fat, the fluid, the mineral. These densities in proper perspective mean either normal or abnormal. They need to know first of all, anatomy, so that they can recognize the normal morphology. But then, they need to know a little bit of the disease processes too, ...if they see gas in an abnormal spot, what does that mean? To answer your question, they go along in a
progression, from just being able to recognize that the organ is in the right place to being able to use their ability to say, "Well, it is abnormal. Why is it abnormal? What does this mean to this patient? How can I better look at this area in order to be able to project it into either further studies or something that will help them make a definitive diagnosis. Is this enlarged liver an abscess? Is this enlarged liver a tumor? There are different things that they may only be able to go to a differential list and not really get to a definitive diagnosis. But, you hope that they can at least get to a place where their thinking process brings them along with this patient, not just the fact that this dog has a liver. This dog has a heart.

Q-3 I think so. We were looking at a bulla series this morning. The bulla of the inner ear. The problem was that the dog had a chronic ear problem, and presented with pus coming out of his right ear. Well, you know he's got an ear infection. But to do a bulla study, which is a bone study at the site of the middle ear and the inner ear is to determine whether this thing has gone in as well as out.

Now the first film out was an oblique view of the right bulla ossea. Well that's the right site for the infection. The other view that was out was the dorsal ventral, (his chin was on the plate). We could see both the bulla ossea. The right one was a little increased in opacity. The oblique view showed that there was a little increase in fluid for that particular tympanic cavity, which is where the middle ear is. That middle ear is the tube from your throat through the eustachian, it goes through that place and that helps you with balance and helps you with clearing your ears and being able to hear. But a student, standing there said, "So, what's wrong?" And I said, "Well, I think that when we get the examination finished, you will see what's wrong." I said, "Right now, you should be able to recognize that this one is a little more white than that one. You should be able to recognize that this has a little bit more fluid opacity, but if you don't have the other one to look at to know what is a normal side, it's a subtle change." I said, "I can see it. But that's only because I have looked at fifty thousand of these bulla and you haven't."

So I waited until the other films were out and I said, "Now compare these two and what do you see?" "Well, this one looks like it has air in it. This one over here looks like it has fluid in it.", and I said, "You're right. That one has fluid in the tympanic floor. But that was not possible to recognize on a limited examination. So, they want to get the answers but they sometimes don't have all of the equipment to get the answers until you can kind of lead them along and they can get some experience looking at it.

Q-4 Some of these are subjective analysis. You expect that that heart on the lateral view is going to be about 2 n to 3 good spaces wide and you expect that on the liver that it is going to come back to the carpal arch rib but back beyond that it begins to round its borders, ...probably enlarged. On the other
hand, you look at the stomach. The stomach in this angle lies about parallel with the rib angles coming down from the spine. Now if that stomach shifts forward, why is it shifting forward? There is not as much liver, the liver is smaller than normal. On the other hand, if you see that stomach angle starting to go this way, you say, "Oh, if the stomach is doing this, something has got to be there.

Q-5 Well, they go through their basic cardiology rotation in the course of their classes and they get these measurements. They get these objective points on what to look for in an enlarged heart. They get information on which chambers are located in which part of the heart, so to speak, and look and see whether that particular border is bulging to indicate that that chamber is enlarged. So they get that at that time. Then, we build on that and we try to get not only the fact that the heart is enlarged but what chambers are enlarged and what does this mean to the patient. He could have a murmur which would explain why the left atrium is enlarged, the borders bulging and that kind of thing. Some of the things that you teach, you learn through experience. Some of the things that you teach you learn through reading the literature that somebody else experiences and has recorded both. You have to build on everything. When I started in 1962, there was probably maybe two bound journals, two issues of The Journal of Radiology. Before that it was a mimeographed sheet. So from 1961 on forward it was the bound journals of 1961, didn't have much in it but that was a start and through the years now we have The Journal of Radiology and Ultrasound which is included, now the ultrasound papers, that's the way things are going now, so most of the articles are in that area. But you do teach from your experience and from the experiences of others. That is essentially all that you have to work with. You look at the books and read the articles and you use that information. Some of it you take with a grain of salt some of it you base your reputation on.

Just last year, we had an international meeting in Philadelphia, a whole week of papers, some forty-four hours of papers on radiology and ultrasound. Some on therapy, some on nuclear medicine; a vast amount of material, you have to pick and choose what you want to concentrate on. But they had a paper on the heart, that if you took the measurement across the heart and took the measurement from the corona down to the apex of the heart and you add these two together, and measured them from the beginning of the fourth thoracic vertebrae down along the spine, probably the sum of those two measurements would be 9.7 plus or minus .5 vertebral bodies. Now, somebody had to sit down and go through an awful lot of chest to see that this would be somewhere in the ballpark.

Well, I start doing these measurements, I find dogs that have a little bit of a dorsal curvature of the spine and kyphosis and your ruler is not going to go around the corner. So, I decided that well, if it is true that the sum of these
two equal that, then if I take the sum of these two and divide by two, it should be just about half that much. See? It's easier to say......but it's going to be close to 5 vertebral bodies, you know. So you use these things, so you say “Yeah, according to the vertebral measurements this heart is enlarged.” But you look at it and say, “Well, I don’t know.” You get some things that are objective and some that subjective and when it comes right down to it, many times our radiographic evaluations of the heart is not as thorough as what the expert cardiographer has seen and the EKG would, that is the two combined, would tell you concerning the heart.

Q-5 Well, sometimes. It depends a lot on the student. When I was teaching the clinical conference rotation I would give them lecture material to review what I wanted them to know about the pulmonary system, the respiratory system and then, I would start with an example of an alveolar, the alveoli filled with ( Ref. 7.1 on tape ) on the film and then we go through interstitial. Then I'll introduce a normal and they'll spend a little more time looking at the normal because their trying to find something abnormal....and it's just not there. If you've done a good job of teaching what abnormal looks like, normal won't be so hard. Because, you know that you're going to have changes in opacity, that is the whiteness of those lungs. What does it mean? You're going to have changes in perhaps organ size related to this. Lung disease may be due to a bad heart (the lining of the lungs...Ref. 7.5 on tape)

Q-6 Because I think they feel that Radiology is identifying the abnormal. In a sense, we spend a lot of time doing that. You don't bring a one year old healthy Spaniel into Radiology and take radiographs of his chest. If you 've got radiographs of his chest he's either got respiratory problems or he's got problems elsewhere in his body that might be affecting his chest. Maybe he has a heart murmur; being an older dog, maybe he has an abdominal mass that you can palpate or you can see on the radiograph. You start looking at his chest to see if he has a metastatic neoplasia. The majority of the time, ninety-nine and forty-four one hundredths percent of the time, you look at the lungs because you want to find disease. ( Divided thinking. Ref. 8.0 )

Q-7 Oh, quite often. Because, take the old animal that has an abdominal mass, we look in the chest to see if he has metastatic neoplasia, the majority of the times he doesn't. At least, that we can perceive. Now there may be microscopic foci in that lung that are some tumor cells. Unless it gets at least larger than the size of the focal spot, I won't perceive it.
Q-8 You say practice. You have just taken another turn here. The institution is different from the private practice of the radiologist. The private practice of the Radiologist may be complication practice. The type of cases you are looking at differ. The rate of abnormalities goes up. Because they find something that they don't understand and they want to know what it is. They have already screened out the obvious normal. Now there will be an occasional one where, they'll say, "Well, we just wanted to make sure before we cut this dog's leg off, that he doesn't have anything in that chest." So, we'll send one along that will be a normal thorax. It won't be the percentage that we see coming through here; because we see a lot of medicine, surgery and surgical patients that we see, you know that might have been hit by a car, fractured leg. We take a chest,..."Why?"...because of the anesthesia we want to make sure that those lungs are clear and will be able to take care of that anesthetic. See what I mean? And in a private practice, we are not going to see that.

Q-9 Most of what they see is pathologic, because they are going to see the anatomy and what is normal in the first lecture. But, as quickly as possible, they are away from that into, "Here are some demonstrations of diseases involving that system." and that might go on depending on how much time they are allowed to talk about that particular system. It could be heavily weighted on the abnormal.

Q-10 I think that they would probably get bored looking at the normal. There is not the challenge but yet there is the input of energy that you can want to find, if there is something abnormal. You want to find it. But it doesn't give you the kick that it does to find, "Oooo, look at that lesion." You know, that becomes (Ref. 10.1) if you find a nice lesion, it's not good for the patient.

Q-11 There are varied answers on this: because of maybe time constraints,...somebody came down the hall and says, "What do you think?" And you look it over and say, "Well, I don't see anything." Yet, you take the same set of films and take them into the darkroom, you sit down quietly and you review, in an organized fashion, you see something. And I have done this. I see something that I didn't see standing out in the hall passing by and somebody says, "Take a quick look." So there is time involved that you spend looking at the film.
Q-12 Well, there are some times when you have looked at something and in your mind you organize your thoughts, you have gone down a certain avenue in your thought processes. You may have missed thinking about something else, that somebody else could think about, and mention. "Well, what about so and so." None of us have arrived at the point where we know everything. And somebody may say, "Well, I saw one like this and it was biopsied and they found thus and thus." Radiologists are always in a learning process. I don't know whether you were aware of that or not. I see things that I have never seen before, and you think now wait a minute, you're saying that after over thirty years that you are seeing something new? That is what makes it interesting is that it isn't always going to be the same.

Q-13 There are some people who are gifted in being able, number one, to condense..... Take two views set them side by side and be able to see that this little bulla, for instance, is so far over here and so far down here and can tell you precisely where it should be in the animal. Other people can look at it and say, "Well, it is somewhere in this vicinity of an anatomic ..."...you know, they go all the way around cock Robin's barn, but they really don't know where it is. That is something that we don't develop, that is something that they have inherent. So, there are some people who, for whatever reason have a skill that we can recognize. I have seen people that I have said, "Have you ever considered Radiology?" .....No, they want to be a surgeon. We must have a billion surgeons out there. I think that the men have a tendency to be fascinated with, maybe it's the old Tinker Toy concept, they like to put things together. And when they see a bone all smashed up, it would be so nice to be able to put all of these pieces back together and put wires around them and plates on them and all this and I think Radiology doesn't seem to have that kind of glamour. But we do see the ability, and some have gained the ability by hard work just spending a lot of time. They will come in and they will say, "Well, I'm having problems in this particular area. I don't see things here." And we give them another set of films to look at and to practice. So, sometimes it takes practice, but those that have the ability can pick it up like that, while the others are just sitting there and working, and working on it.

Q-14 It is a gift. Some of them should have been truck drivers. There is one other thing that I want to hit on because I have seen some changes since I left there, I won't say that they are disturbing, I think that they need to be re-evaluated, and it took me a long time to get this done, but I got the radiology basics in the first year, for a reason. We wanted to use radiographs in the anatomy lab, to teach radiographic anatomy, to help teach anatomy by being able to see through the animal and not just have to pull it open and see a
bunch of pickled tissues to say this is where the liver is, but reflected in the live animal, doesn’t look like that. It doesn’t look like that cadaver. There are other things that occupy space. The students were perplexed with radiographs in the anatomy lab, when they didn’t understand black, white. Why is the black white, what does it mean? You know that it is like having a blueprint for the first year architectural student. He wasn’t ready for a blueprint yet. He didn’t know what these squiggly lines meant and the symbols for this and the symbols for that. See what I mean? So, we tried to get basics into that, not to study disease processes at all, but to say, “How does a radiograph become a radiograph? What does it mean? What does black mean? What does white mean? What does gray mean? How can you apply this to the study of anatomy?” Well, since I left, it was taken out of there. So I don’t know whether they are still using radiographs in anatomy and whether that ............

Teacher (Segment 4)

either they get a little block...or they get, um, a ...or they have some extraneous reason that’s buggin them like some personal problem...or they just can’t concentrate...um...I think that my...satiric view of education....is that ...if you talk to me...actually, if you talk to me one on one...and I’m given time to process it, I can deal with it pretty well...but I was speaking too fast for her to follow...she wasn’t with the flashlight portion....it was just a thing she couldn’t get...and if she actually goes home and does it, she’ll get it...and that’s good...taking my word for it isn’t what I wanted her to do...what I want her to do is to go home and get the flashlight out....but I think that people...some people...look at you(...) for me, its the written word.. I would far rather read a chapter than listen to somebody lecture..that’s the way I learn. When I went to vet school I never went to vet school the first two years...I stayed in the library the entire time and read...it kind of hurt me on exams but it helped me in the end.

when she comes up to me an asks me a question, she might be so terrified of me that ...I could talk to her and ...what she really wants is for the encounter to be over.

I think by dissecting all these damn parts...I was pretty good at geometry, although I wasn’t good at geometric reconstruction...

some of it may be one’s interest in learning about spatial relations...the other is ..I don’t know, I mean, I’ve read...that people have different abilities to grasp uh spatial relations, and some of that is environmental and some of that’s genetic...and I don’t know enough about it...
yeah, that's actually been published...and I don’t know if that's environmental experience...I don’t know that I can say that (that he sees it in class)...I’ve always tried not to draw the lines about ...what behaviors I should expect...I can tell you what I observe...things I observe are differences in how they approach you, differences in how they look at you, differences in how they react to you when you make them upset...I mean, those are clearly gender based differences...I mean, actually, the only thing I would say is that in general the women are more conscientious students than the men...I mean, that's my general vision about ...that. That they are usually ...more mature, and usually more engaged in the subject...that's my view of it...now there are exceptions to that, but ....

Yeah, there are some students...I don’t actually know who they are, as far as what is characteristic about them that helps to identify them, I don’t have that feeling...

What I do is I do shadows, I do examples, I ...try to use the specimens to give them some help because the specimens are in 3 dimensions...I’ll be honest with you, and embarrassingly frank with you, my feeling is that I probably...there are quite lots of these students who are totally blank about this and I never know...I mean...how would you know it? Some of them won’t say anything, some of the ones that do ...I mean...a student approaches you, and they have a problem, and it’s a serious problem, I don’t think it can be dealt with in this laboratory. ...it needs to be dealt with one on one in some kind of ....(interrupted by student question)

Student (Segment 5)

Q-1 A lot of times they would put something up there and it would already be oriented in the right way and then they would say, “Do you see anything abnormal?”, even though I had never seen one before and maybe I would guess, and sometimes I would be completely wrong. And then, they would point it out to me. And then they would tell me what a normal one would look like, and if there was more time later on, then they would show me a normal one that they would have there.

Q-2 Maybe more comfortable in a practice, because I’ve been there for awhile. I feel like I know them more on a personal level. It is not as intimidating, I guess.

Q-3 It’s kind of a joke. I was more worried about the dog or the other animals, trying to get everything else down and then before the final. Because I knew these people in my class had been looking at those radiographs, to me, this wasn’t worth it. I was going to learn it too, but I have
a pretty good memory, so I could go over there and see how they had everything labeled, memorize it like the day before, for like maybe a half an hour, and then I could spit it back out for the test.

**Q-4** I don't know so much about "sucking up", I think that they were just down there. I think that they just wanted to get everything right. I really don't think that it made a difference in me looking at it for a half an hour as opposed to them looking at them, because I still think that I remember a lot of that stuff. It gets re-enforced over time, but I think too, it's just in how people use their time.

You would have lots of time between 10 and 12, and then you have lunch from 12 to 1:00, and people would stay in there during lunch. I wanted to eat my lunch, so I didn't do that. It always seemed that my group was always just a tiny bit behind.

**Q-5** In the Canine Anatomy there are three of us, myself and two other women. They are complete opposites, and I was kind of an in-between. The one, my lumbar partner, she is really funny and everything but she is more of a high-stress person. She will stay up until like three o'clock studying and the thing that made that difficult was that she actually wanted the dog to be pretty meticulous and the other woman, she's pretty laid back, she's a mother with two kids. And she wants to learn everything too, but she's fine, ( ) and get what we have to get done. And then there is me, I could go either way depending on what we needed to do that day.

**Q-6** But it's funny too, because when we went into equine, I chose them as my partners again.

We got along great, so you even move faster with a horse and then the other three people that we picked up, they're two women and a man, like we would work on one side and they would work on the other side. And we all worked at the same gait too.

**Q-7** Oh yeah. All of them are my friends.

**Q-8** I think he was a bright person, it might have been a little intimidating for him to be with five women, but most of the time he would kind of sit back and it was like he already knew it, so he really didn't have to go over it as much. But if we needed to know something, he would always point stuff out for us. But I think that he was kind of a shy person too, so it's kind of hard to tell.

**Q-9** I don't.....I think that it is more of a personality conflict, I haven't really picked up on anything like.....intelligence. My cardio one, that was mixed and that was just horrendous, because the guys in my group didn't get along very well. And then, two of the guys and myself ended up being more of a tutor to other people and that was frustrating and we just had personality conflicts where we would be in our group for six hours where it would take other groups two hours.

**Q-10** I would say that in my group, that wasn't the case. Actually, it was the opposite, because if my group got out of control, I would be talking a lot more
than the other people just to try to bring things back down to earth, I would be
more of a stickler and say, “No, I’m not going to do that, it’s ridiculous.”
Maybe I’ve just been lucky.

Q-11 But, I didn’t do the radiographs. When we did them as a group, in our
last ones, there were about twelve cases, and what my group did is we divided
them up between people and there’s two people in my group who really liked
radiographs, so I had no problem in letting them do that. So I let them do
them, so what we did was we collaborated, and helped each other.

Q-12 I think that it is because things can be gray and when you see gray
things sometimes.....ah..
like there’s the different patterns. Like I know alveolar pattern but there’s
that one that I can’t remember what it is right now, ....interstitial.....that is
very difficult for me. Obvious things, I can usually find, but I think that I’m a
“cut in stone” kind of person. And if they said, “Oh look, it is kind of
elevated a little”,.....maybe it didn’t look elevated to me, or if it’s more over to
the one side than the other side, sometimes if it is not really well defined I
would have trouble saying, “Oh
I see, okay.” And some of the other things, just like as far as being bulges like
with the heart and stuff, sometimes I don’t see those bulges right away
because maybe they are not as obvious to me,
as they would be to someone else. But if they would point it out to me, then I
can see it better. But not all the time, just sometimes.

Q-13 I can name you two things. Just from my cardio group with the
people that wanted to do radiographs. One is that of their exposure in
practices, they have had more exposure that way. Kind of comparative to me,
but maybe they just liked it more than me. I liked it, but I didn’t go,
“Wow! That’s great!” And another thing is too, I don’t know how this is
going to sound, but I think that it’s kinda the instruction here in the
school.....I found that they are ( )actually
heated, the lectures that we have in radiography.

Q-14 No. Well it depends. Because some of the examples are very obvious
and “yeah that’s great!”, but a lot of the other ones , ....I talked to Trudy about
this, ....they’ll just take the pointer and then they’re talking to themselves,
and not to the class and then they are circling stuff and I’m like, “I don’t see
what you’re circling”, and then they’ll say, “Well, this isn’t a very good
example.”, ...click....and they move on. So, actually I would find it better, I
don’t know, ...if someone taught it differently or if they changed it, because to
me, I could have gone to the slide projectors, read a paper handout, and then
just did it on my own.

Q-15 Maybe because some people haven’t had the exposure in a practice
before so it might all be new. Because I knew what densities were, but I
couldn’t put them in order, well, maybe I could put them in order, but that’s
what I’m saying, in practice you know this is water and this is fat because of
the color or the shape, but maybe more specifically like “the beam penetrates
this”, or it could just be the instructor too, because I took it personally when
the instructor got up there, and lectured to me with her eyes closed. I guess
I’ve known other people like that in my life, but I take that personally and I’m
thinking well, this person is retired and maybe they don’t care and they just
want to get through the hour, ...I just thought that that person just didn’t
want to be there. So I don’t know whether that instructor has been here
doing that same lecture all these years but maybe if somebody else came in
and had a different approach.....?

Q-16  I say probably not. The more subtle ones, I would say no, because a lot
of times when I have even picked this up in class so this is everybody, they
say because it is a reprint. They will say that this isn’t really very good because
it is a reprint and you really can’t appreciate it. But if you go down and.....I
don’t know why it would be good in a slide carrousel, or else it’s in the cardio
group, they use real radiographs. Or they’d say if you’d worked on this case,
you might be able to see it better.

Q-17  It was helpful, but it would have been much more helpful had there
been more copies available. There is only one copy per case available for all
the group. And that gets really messy
because people were actually fighting over it. I found it better to see the real
radiographs, I can read those better than the slides.

Q-18  Maybe because it’s more of a one on one. It is less intimidating. It
really depends on who’s instructing me too. If they are my friends, I feel
more comfortable. I don’t feel so stupid saying, “well, I really don’t
understand that.” It depends too, maybe because when I’m going through my
notes at night maybe I might have forgotten something or maybe I might be
like a day behind, and maybe they’ll have it more down pat and they’ll go
“oh, don’t you remember? Look over here”......TA-DUM!.....so, sometimes it’s
things like that that I might have forgotten. Other times I just don’t see it.
But after they point it out, I try to remember it the next time. Sometimes I am
more exam geared, so I’m thinking okay, “what was that specific thing look
like?” and then I would try to memorize and try to apply it.

Q-19  Not all of them, but some of them I kinda think they are distant. And
maybe like their tone of voice in class, like they are more stern. Maybe too,
they are totaled. Because you hear people talking ....I’m in my second year
and I don’t have a clue and maybe my question is really dumb.....
I have asked some questions and I have been totally shot down before.
Completely shot down!

Q-20  I will say, “Well, this is my understanding.” and they will listen to me
and say, “THAT’S COMPLETELY WRONG!”  Okay, Alright.......and then I’ll
say, “Okay, could you explain to me what is right?” And they do, but maybe
after that I was mentally a little hurt, so the words didn’t sink in all that well.

Q-21  Honestly? Most of them are men. All except maybe one,
Q-22 I would situate it so that the head’s at one end and the tail at the other. Then I would try to go through what I should see and what I shouldn’t see. I think that there are about six normal things that are on that. That is something that I did learn from the last quarter, but then again that was memorizing in my head from my notes. Caudal-vena-cava-trachea -and then I try to think of anatomy things. I would try to look at the colors and different densities. And then I look at the bones to see if anything is broken, and if they are then I would go from there. I don’t go from the center like they say, I just try to take in the whole thing and if I don’t see anything then I try to specifically pin point down different areas. Like maybe then I would go like from one side to the other. But I would try to get a general idea.

Q-23 No. I would find that next to impossible. I would find it hard to believe, because there is really no right or wrong answer. In definitive cases there are, one thing that I had to do over christmas break was my own dog. We took a ton of radiographs, obviously something is wrong but nobody is sure what it is. He is an older dog. Something silly, like I know that he’s got tumors on him but they are not even showing up on the radiograph. Well, there are some other things but they are like “well maybe its a loop” .......

Q-24 When they did break up the class into like A, B, and C ......I think that the instructor was French, that might have been a little hard because of the accent, but I thought that that was kinda good because they did have radiographs up in the lab and he had us go around on our own. So we were kinda thrown in after a lecture which nobody got anything out of the lecture, but then, and this is honest......the last ten minutes he called everybody up and he drew things on the board, drew them, and then he explained, and then we went around to the cases. And I thought that that was kinda good, you know, because if I didn’t see it, and then we went around, it made it kinda clear, you know. Maybe it was the second exposure. So maybe something like that would help, but I don’t know how they could do that all the time for everybody.

Q-25 Because there is a list that says, “Dogs are this way......boom-boom-boom-boom-boom. It should be this size between these ribs or it should be at this angle or this shape and then in that case they showed them on the thing, on the slides in class, and I looked at them, and I mean just the pictures fit with what the words said on the paper. So I guess I was kinda taught that, but I memorized that. It’s like “A cat’s heart should be like one to two intercostal spaces wide and touching the diaphragm whereas the dog’s doesn’t.” Stuff like that.
and take a good look and see if there's anything really unusual about the relationship. In other words, the joint isn't dislocated is it? I hope I see it. I hope that nothing is out of line; that everything is in it's proper place and that there's no general big fracture jumping right off the thing at me. And then, I start looking at the finer things ...and then, you usually look at a series of radiographs. So, inevitably we will go to the ones that will be rewarding first (based on what the history is). In other words, we're looking at a carpus; we'll look at the lateral oblique which shows the medial part of the third radiocarpal bone, that seems to be where the trouble is. I will eventually have all the radiographs in my hand and have them all in the hot light, before I'm done with the examination. And if things are negative, and here's another point, if things are negative I admit to doing a better job of examining the hock. If I find a glaring problem, there's a tendency to stop. But what you ought to do is keep looking to see that there's not multiple problems on the radiograph.

Q-2 Because it is so easy to be lazy. It is so easy to just go follow along and have the instructor say, "Now here's what it is,...here's what we need to do, etc." And if you follow along that way you don't have to think at all. Every student ought to be one step ahead of the instructor. In other words, they ought to break their butts to get to the x-rays before the instructor and try to read them before the instructor gets there to read them. You see if they do that. The answer is, "Not very damned many." The good ones do and I learned early on from whatever methods I ever could have that I try to make the decision that I would make......before they would make a decision. And good students do this, then they would learn our point. Then they are really in the game. It's easy for students to be passive. It is so easy just to wait until the work is done and go home. It's just so easy to do that. And then, some instructors are not very diligent, and maybe they're having a sour day and they'll just grunt a little and say, "Well, the damn thing's got this......let's do this." So there's not much teaching guidance came out of that day. You know, we ought to be talking more. To teach well, you have to use up a lot of words in an enthusiastic way. And it costs you a lot of stress to do it well. Radiographs are particularly hard.

Q-3 Well, the thing of it is, unless you have radiographs that can be seen, in other words, they're probably going to have to be in slides and they're going to have to be of excellent quality. If you're talking about shades of gray, as in belly work, and that sort of thing you're just about not going to do it. That's why we have clinics. So you might as well say radiographically, you can determine this and this and not show the damn x-ray. If you're talking about fractures, (if you had good radiographs of fractures) you can see them. Evidenced ( ) but the thing of it is that there's a tendency for some instructors to use bad radiographs as their notes. The radiographs may not
impart a damn bit of knowledge to the student but when that radiograph comes up there is a flow of words that comes from the instructor because he associates this paragraph with a.....you know a lot of times slides are not very helpful in a lecture, except they’re our notes. I know you know that. In other words they remind you to say this and this and this. Now, this can be good if the radiographs...(I’m talking about slides in general) ....if the slides are good and it helps you make some continuity to your lecture, then it’s a winner, but if the slides are distracting because of their bad quality or because they’re not really on the subject, I needn’t tell you,.....that it’s very negative. You ought to have a blank slide in there, and say the things that need to be said.

You can teach a lot about radiography without having any history. You can take a pile of x-rays and teach them how to read the information off the celluloid. I believe you can. But it’s probably harder because it doesn’t make it live as well. If you can put some history with the case, then the student becomes more motivated to say,....try to help solve the dog’s and it’s owner’s problem, for example. Whereas if you’ve just got a pile of celluloid, they get to be sort of drudgery. Now we’ve seen students assigned to radiology, go back there and plow through a whole big pile of those things and I’ve always thought, there doesn’t seem to be much motivation there. You’ve probably seen them doing it too. There are typical examples of this and that and the other thing, but if you,......it’s a hell-of-a lot better if you have even a new graduate or just one of the students read the histories and present the cases to the others, it would be a lot more exciting. You can get something off of just plain cold radiographs.

Q-4 The ones that can’t stand it, don’t need it. Because if they’re so sensitive that they tighten up when you put pressure on them, then they can probably learn it without having the pressure. Now that’s not always true, but the people that have the personality.....because they’re usually conscientious people who are too concerned with social approval and so those sort of people tend to be highly enough motivated that they’ll learn it if you don’t put the pressure on them. I’ve taught two distinct kinds of students and especially I can tell it in the residents even more, and then there’s a spectrum in between them, they’re the kind that just didn’t give a damn. Didn’t come in, would do the minimum of work and then go home and forget it, never see them. Then there are the ones that you’re in the building at eleven o’clock at night and they were in here checking on every one of their patients. Not only checking on them, but worrying about them. You soon learn their personalities.

You can’t treat everybody the same. Some of them are already too conscientious and they’re being ( strapped ) to the max because they think they’re not doing it well enough and then there are others that need a motivation to even give it the minimum good care. And then, there are students all the way in between them.
Q-5  A little of both. But it’s more art than science probably. But you have to have some scientific background to be able to do it. You know the sign that we have in the kitchen? It says, “When you know how little you know, you’re ready.” Now half of those students I told you about, need to read that sign. You know? And the other half need to read a very different sign.

Student (Segment 7)

Q-1  I think more times with the older doctor than with the younger doctor who was a male doctor, the female doctor wasn’t there as much, but they took more time to explain things to me, I guess, because basically what I did was got there in the morning, followed them around, whoever I wanted to follow I could and then I could see them in like surgeries, follow them on cases, and so...

Q-2  She was a little lower at things. She took more time for surgeries, she took more time in her office calls, and I could kind of tell this, but the other two doctors were sorta more efficient and they didn’t do things like.....if the dog looks fine they didn’t do little neuro testing in the physical exam, and she was extremely thorough, she had sort of a ......she’d come in and make a cup of tea and she was very bumped around. She was good, but that was just her. She was extremely laid back. When I was with her, I didn’t see as much. It took her a half hour to forty minutes to do an office call. And the days of the week that I picked to be there, I think that the other two doctors...usually it was Wednesday, all three of them were there, the other days two were there, so it just depended on who was working that day too.

Q-3  I think when being newer out of school, younger doctors knew how to explain things or knew what to tell me at a level that I could understand or he knew or he could remember where I was and he’d say “Oh, I remember this in school and I remember when I got to this stage”, so he had more, ...a lot of things that apply to me now, not that the older doctor didn’t but he was like, “Well, it was in the 60’s when I was in school”, so just being out the last few years, he could relate what he was doing to how he was doing it in school and exactly tell me things that I could expect to be learning. It’s like, you know, when you get to this stage they’re going to tell you this and this is what I do, you know, and how much of what, you know, you were learning he thought you know you’d actually be using, so that was nice but the older doctor had you know, he’d done a little bit of everything. He’d had a mixed practice when he first got out and then, now he’s just only a small, so but he, ...I was pretty impressed because he just seemed to know about everything and you know, I think he had to, of course because he had been doing this for so much longer, had to go back and consult books less and seemed to know just what to tell everyone, he was really good at communication. He knew
how to...you know...put things to clients, and to me, at a level that you could understand in simple terms.

Q-4 Hmmm.............Well, if it is someone older, they sort of have much more knowledge,...I'm thinking of an example like, someone is lecturing to you in class, and they can explain things much better, but somebody your own age ....or ability level might be able to explain things. I don't know.

Q-5 Not really, I would say it's more teaching personality and style, that makes a difference for me.

Q-6 Okay. Hmmm....I'd say it would depend on who is in my group.

Q-7 I'd say that at least to start out with, when you have never had....at least with the students I know haven't had much contact with it, so I think that although it is a hard thing to look at and grasp that - that is the best way to start out, because the professor is telling you specific examples of something that is supposed to be there most of the time.

Q-8 I sit in the third row, so most of the time I can pick it out if they point to it.

Q-9 No, I couldn't pick out the chest tube that he was looking at.

Q-10 It depends on what you're looking at. When you are looking at cardiology, the heart was so essential, it was pretty easy to see what they wanted you to see, but when a respiratory view you're looking at the lungs and you're looking for, you know, shades of, you know, gray with the lung tissue, that was hard to tell.

Q-11 I think, that with everything that we learn, there are people that are really gung-ho about it, and have a big knowledge base going into it, or they've worked in a clinic, either as a technician or someone that has seen it a lot, and then there are people that are going through it for the first time that when they throw it up, somebody who has seen it before, has been reading ahead will be “Oh, well, that is that!” So, I don't know whether you've got a knack for it or not, I don't really know yet, if I do. At the moment, I kind of feel like I can see some things if you kind of hold my hand, but I think that there are people who sort of get a jump on things.

Q-12 I would like to think that hopefully I will be doing that. I think that when you look at it, and if you have no idea what you're supposed to be looking for, you can't see it, but if you look and you can say, “Okay, I know to look at this system, this system, this system and this structure, etc.”, So that if you have done it enough you have sort of a plan.

Q-13 I'm being told that I'm supposed to. I do exactly what they told me not to do. “Look at everything and jump to the first thing you see and interpret that!” And I do that. I don't know how many different people have said, “Don't just go randomly “ We'd put them up and I would go like, (looking all over) and then going for the brightest object. Making things up.
Q-14 It's like an art thing, your eyes are drawn to the brightest object. So you are naturally drawn to the, you know, all the bones and the heart because they're right there.

Q-15 I thought that we had a pretty group. This is the cardiology group. There were seven of us.

But there were several problems within, we would divide up and be mainly responsible for looking things ( ) and then we would all get together and discuss what certain people found, and if we agreed with it or not.

Q-16 One guy I didn't know until we did it, kind of laid back, pretty quiet but volunteered to type when no one else wanted to type up the project, and one good thing about my group was, nobody was a slacker, no one didn’t want to do their share, and from the horror stories I heard from other groups about people who would fight about their point, ...we didn’t have that. People would bring up suggestions about stuff but if nobody really agreed, they’d drop it. We had two guys that were good friends, pretty out-going, one’s Dad was a vet so a lot of times he was saying “Well, my Dad, I talked to him about this.” And two girls who,...I hadn’t met up until then, who were pretty quiet, sorta “grunge” type, and one hadn’t.....she wasn’t ( ) so for a lot of the things that, you know when that was related to the case, she didn’t know so a lot of times she didn’t feel comfortable, contradicting anything anyone said because....all she would say is , “I don’t understand.” Basically, we were all on the same level except when it came to these types of problems. One girl who was really out-going who really took a lot of initiative, you know, if there was anything left over to be looked up, she went immediately to the library, looked it up very first, then we had things assigned, typed up notes for everyone and said, “Let’s get together this time” so she really went out of her way to do more than her share.

Q-17 I did my thing, and then I would explain what I thought or if somebody said something that I thought was wrong I’d say that I kind of thought it was like this, but I wouldn’t say, “You are wrong!” So, I mean,...we got along very well.

Q-18 It was a little hard to tell, just because we were so new with the stuff, we didn’t have enough ideas, we couldn’t look at something and say “Well, I remember this characteristic “, I think that was,...I don’t know what is what you were asking before.....something about how the group is learning from each other, because I think that in our case it was good some people remembered certain things from class, like I didn’t have anything set to memory yet. We had heard things in class, and I might have looked at it, but I couldn’t look at this and say, “Maybe this is heartworm because I remember these characteristics.” And between us, sitting there with out notes, there were enough people that said “Well I think that I remember this about heartworm disease.” .....and then it would click. So for me, ...working with the group, it wasn't just my brain that had to remember it, there were seven other
brains that, you know, people were reminding me about stuff and once somebody had clicked onto something, then we could go from there.

Q-19 Well, hopefully, I think, like, you know, worst case scenario, they throw up a radiograph and you have no clue what is going on, but I'm like well, if you took the radiograph you'd be looking for something, so there's someplace to start, you at least have some possible system that you are looking at and I think that if I've gone to the trouble of taking this radiograph, I have to at least suspect something or at least there is something I know I want to start looking at, so at least that makes me feel better, somewhere to start.

Q-20 Sometimes, I think in class, I don't know whether they do this or not, say this dog was presented for this and now what do you see, ...because that would be extremely helpful, I mean nobody .....you know, when I came to that revelation, you know, I should never have a case where I'm just staring at a radiograph with no animal attached, no history attached. That kind of made me feel a little bit better, like I know what is going on. But, I can't remember if in class they ever said, anything about......other than saying, "Now we are going to look at this." , and here it is.

Q-21 We were really polite, compared to other groups that I had heard and just kind of watched with Erin's group, ....I can't remember what we were talking about, but none of us really had a good grasp on it, ....and we were debating something and one guy was actually right about it and you know, he would say something and then, you know, about five of us would go, "No, I think it's this." And went through all of this explanation, and I think that he was getting frustrated, but eventually he explained himself and, I could tell that he was frustrated but he never said "look you dummies, I know you're wrong and I know I'm right."

Q-22 The people that I hang out with are. ...If they know what to tell you when, like I was saying about that one lab that we had for the respiratory class, we walked in and he drew pictures on the board and you know, it was so simple, that "Why didn't I see that?"Here are five patterns, then walk around each station and look at very clear examples of these patterns. You know, he started us off with that so then we knew what we were looking at, instead of the other labs we walked in, and said you have 15 minutes to walk around, look at them and in the end we are going to discuss them. And so you walk around and you kind of read the card the history and stuff, so I would say that I got more out of knowing what I was looking for first and then looking at it, than just randomly walking around looking at things, I would look at it and I'd think, "What am I looking at, I don't know"..........and then when he said look for these five patterns, I would say, "Oh, that's the one", "here it is",so that made a huge difference to me, that lab I got so much out of, and then from that point on, it stuck with me. Why couldn't we have done this to begin with? Knowing what to tell people in the simplest form, and
then working out from there, I think...............because some days I'm sitting in a class and you know, they say, "we're going to talk about this", and then we get into such little detail, you lose sight of the big point and it doesn’t get connected and that happens all of the time. They start at the beginning of the lecture, and dive in, ....like who was it,...Dr. Schrader, on the first day, the first musculoskeletal class, he didn’t start lecturing, he just said I am going to show you a couple of cases, ..actually I can’t remember but he said this dog was presented for this and now look at this, I’ll give you a couple of seconds...look at it....look at everything, he actually he did say “you’re looking at the size of things, the shape of things”.....he gave us a little list and said okay now do this, and that was kinda fun, you know, trying to pick up on these, like “do you see this?” And so I got more out of that than anything yet so far.

Q-23 Hmm..........Well, for me in general, studying in groups, either you study with people who know a lot and then you think, “Oh man,” they are going over stuff that you know, so for me, every group study thing that I’ve ever been in .....very few times have I ever gotten a lot out of it.

I feel that I am just there and so much time is going by and I am so much more efficient if I am by myself going through stuff my way. Looking at what I want to look at when. But for group projects I know that I could never come up with all the things to think about on my own, so that is good.

Q-24 Hmm..........Let’s see, that’s a hard one, .....because with radiographs I get a lot from being around other people, because .....what am I trying to say....at this point they are seeing things that I’m not and I am seeing things that they’re not, it’s not like ......you’re just sitting there with a pile of notes in front of you discussing things, you’re, you know looking for something. Normally, I am not a group person except when.........I’m trying to remember one of the first labs we had with Dr. Levelle, we were walking around and you know we were just walking around with people and talking about stuff and I probably got more out of being with our people than I would have by myself, because....but maybe farther down the line when I have the knowledge base and I know, “Hey look at this, and look at everything here” I don’t know whether I’ll be , you know, good enough on my own or whether I’ll feel like I should have......

Q-25 A lot more when they said that they could be on the lab practical. At first I didn’t even realize that they were there, I didn’t see them and then I kind of saw them and I thought well what can I get out of that at this point. And then they said, “By the way, make sure that you look at those because they said that there would be questions on them on the lab practical.”

Q-26 What I did was, I went around.......and the guy who was behind me thinks that I’m totally nuts, but when I am in class, and if there are like slides are better, exactly word for word, but if there is something up there that
is not down, I’m writing it. And usually if you ask me, about any slide, I
could probably tell you what was there, so for me I just walked around and
you know, wrote down the names, because we are not familiar with the terms
at that point yet so, you know I wrote things down and then I’d look at it
again, really I just went around twice before we were tested on it and I
think......there were a lot of obvious bones so, it was helpful in a way to see,
learning structures, and it was another way to look at things instead of
playing with your bones.
They had to make you learn it by threatening to put it on a test, and then
doing it, if you could remember what it said, they covered up the cards,...you
could do it. They left them up but they covered up the cards and put a little
arrow pointing to anything on there. Like, I remember, I was glad that I had
spent time looking at them because you know, we were talking about
....something about the abdomen......gases in the stomach, So I go, “I’m glad
that I looked at that”.

Teacher (Segment 8)

Q-1  I remember some of it, I mean, it is not vivid, like yesterday, but I
remember some of it.
Q-2  I remember, in anatomy, they showed us some x-rays, just like....we are
really learning anatomy, but they show some films,.....and I remember
thinking that they were pretty cool, I mean, you thought that you were a
doctor you know,  really you did, you were so naive, and you’re like
“Oooooh! That’s a radiograph, you know?”....“I’m reading a radiograph!”  So I
remember that.
Somewhat enchanted by it, you know?
Q-3  I don’t know, I mean, I guess to me it is the back set. Number one, it is
something like if you are not doing something medical, it is something that
you need in the medical profession, it is something that takes a person
walking down the street and you have a certain image of them, and how they
are, but an x-ray is a very different picture of that. It is only medical, so like
ER would use it because “that’s the hospital”, you know?  Don’t you think of
an x-ray when you think of a hospital?  And maybe it’s because it is one of the
first things that let us actually have a glimpse of, or a different perception of
it, like being up in a plane and looking down?  You know what I mean?
Well, it’s like ultra-sound probably is a lot neater to me now and we get a lot
more information from it in some ways. They are symbiotic. But, it is still
not as symbolic as x-rays, you know, to people.
Q-4  One thing is, an appreciation of anatomy.  The students, so at first, it
would be like their knowledge base coming into it, like do they actually know
that....how the heart is oriented,  they know how the heart sits in the chest
because they paid attention in anatomy and they kind of had a mental image

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in their mind anyway, so now they are just fitting that to the x-ray as opposed to someone who is looking at the x-ray with a blank slate. That would be one thing, what they come into anatomically, I guess the other thing is ......I mean it is something that is impossible to put into words that you can call it “clinical skill”. By the time that they are seniors now they have had a lot more exposure at different times, but some people can look at a film and you go, “Now see here at the artery bronchus vein,” and they look back and they go, “Yeah,”......and you know there is some difference in students with the neat ability to do that, but I don’t know.

Q-5 Graded are not always correlated with their clinical performance in this sense, reading radiographs, but it does come into that first part of the knowledge, but it is kind of separated into the knowledge base and then they have some innate skill. The knowledge base part still does translate a little bit. But the exception is that some four point students can’t like identify that it is a radiograph, and some two point students like amaze you but, ....I would say that the trend would be

higher grade point average, better reader, they spent more time on their school work, they spent more time learning how to read the film, you know, they just are maybe a little more dedicated, but not always. ............You know that I’m not very cognizant of that, I don’t pay attention to that as much as I should.......I guess age, and gender ......I’d have a hard time saying because I don’t usually notice, I don’t think about it that way.

Q-6 I think that it can make a difference, for two reasons. One, the person who speaks up gets feedback on her thought processes, and the other person doesn’t. But probably more than anything I think that if you are going to say something you are definitely thinking, like you have a group of students and you ask them a question and I notice this when I have a small group versus a big group, You have three students and you ask a question about the film and see that they are all looking at it, because they figure that you are going to say like “Shirley?” And then they’ll have to say, so they are thinking and they are going through the process. If you have six there, they start to like you know, ......not really paying attention, in the back......they are not going through the process, so even if.....and maybe that same thing of number would translate ( )Because they aren’t going to say it, I don’t know. Because maybe this ( ) person is very methodical and is thinking and thinking but just isn’t going to say it. I am not sure if those two would correlate, but when people don’t answer, maybe they didn’t take time to think, or maybe they thought but just didn’t say. I’m not saying that it would necessarily work that way, but if because they are shy and they have just throughout all of their education not spoken up, I would be a little concerned they might not be going through the process.

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Q-7 I am lucky because I don't start with them from scratch, you know, when I see them they have already had, "what's radiopaque"...and "what do those words mean"...and they already kind of have some appreciation. They definitely are not able to read them. But, see for me what I usually do, the first day, radiographs are really important, and they are going to see a lot of test radiographs...and I know that when we are on the clinic floor, sometimes I'm going to just go "this is what is abnormal"...I make sure that they all can read, like where the normal anatomic structures are, so I make them point out where each chamber is on the radiograph of the heart, where the vessels are...actually anatomically identify everything, which amazingly sometimes the seniors, they still can't do. But that way they can usually if you go over it, then they can. So, they could at some point, but it is not fresh in their minds, you know, they can't really use it well, so I will have them go over that. And then I go over what the classic,...I mean I guess it is sort of pattern reading......What the classic abnormal patterns are, Like what happens to the heart on both views if this chamber gets big. Well, you get a bulge here and you get a bulge here. What happens if this chamber gets big, you get a bulge here and you get a bulge here. You kind of go through all of the abnormal patterns. Same thing for vessels, same things for lungs.....Oh! I remember, the first thing that I always do, (this is my first day lecture) "No matter what procedure you are doing, do it in the same way every time." I do think that's very important, especially on radiographs. Anything, ....physical, radiograph, x-ray, ECD (echo?) Because especially one thing, once they can read it, their mistakes aren't going to be made because they couldn't read it, their mistakes are going to be because they didn't look at them. You know, they missed a certain thing, because, that's really true, a good clinician, because that is when they get burned,..if you're in a rush, and you don't look at everything. You look at this obvious thing because it popped up first, so I teach them to find a way that you are going to do it and do it the same way every time, like there are different ways that people do radiographs, some people look at it as a system of concentric spheres and go out or go in, some people look at it by anatomical part, which is how like I do it. I look first at technique in the bone, then I look at the lungs, then I look at the heart, and then I look at the vessels. And I always do that order, so that I don't forget to look at the lungs because the heart was really big. You see what I mean? So I always give them that order lecture. I tell them to go over normals......normal anatomy, then we go over the classic abnormal patterns, and then I guess it is just practice, you know, it's just having them look at them and get them. Now we give them an award for the flow time, I have two sets of radiographs, about twenty patients, and they are supposed to go over them and I have a written out "what the diagnosis is and what the abnormalities are on the film."
Q-8 Well.....I guess that it does a couple of things. One is that it's more
time, one is that they may be a little more willing to express their opinions.
You know, they are not embarrassed like
saying something about them as much, I guess, and not something dumb,
you know like incorrect
that then they perceive was dumb, because they function that way. So I
guess more of a small problem base learning, it is kind of like they are
working through it as opposed to having you guide them through it. And
then, I mean, from an honest ......off the record....they..... we have them do it
so that we can go to our office for a half an hour, you know, ....I mean...!
Especially for down time. You can’t be with them every minute. You have
to do your other job, so...! I figure it is another way for them to learn, so it
kind of has all of those reasons, I guess.

Q-9 I would say that some are, but for me I feel like most aren’t. You know,
it’s kind of interesting because you go through a transition, like when you are
a resident and when you are a faculty member? And for me especially since I
had been here, like when first I was an intern and a resident and then even
when I was a junior faculty member, but like when first starting as a faculty
member, most of those people knew, “Oh, she was a student here, then she
was an intern here.” You know those people knew and could identify with
....I was just them but a little farther ahead. You know what I mean, so they
weren’t afraid of me, there was much more kind of, you’re one of them. But
the farther I get away from that, you know, I have students now who go, “Oh,
you were a resident here?” You know, it’s like I have now become like what
I used to think of as ....
how I thought of the faculty members. You know, who are they? You know
what I mean, I’m more
anonymous now, so I have kind of seen a transition as I have gone through
that period of being treated like one of them as opposed to being treated like
....someone would walk in your office and you could tell that they were out
there thinking , “I’ve got to go in there and ask her this.”, you know, whereas
before they would just go in the hall and go......you know what I mean? You
know
I see some difference, although I still don’t feel like most students are afraid of
me, especially not in the clinic. I mean, we try to have......I work pretty low-
key and jovial and we try to keep it kinda like that, so I don’t think that the
students in my ward are afraid of me at all. The sophomore class might be,
because I yell some. (My evaluations requested it, not my numbers?)

Q-10 That is really hard. The biggest,.....I guess two things about that...the
first is that the biggest
......there is a lot in the literature about measuration, like make this
measurement make that measurement and most recently there is a scale by
Buchanan called the Vertebral Heart Scale, to measure the heart versus the
vertebrae bodies, so there is a lot of measurement and I teach the students
some of them, but to be honest I don’t emphasize them. And it is because there is so much variability that those numbers aren’t ( ) and so they just have to see a lot to know what normal is. That is why practice is so important.

Q-11 Well, see and I did, I guess ( ) who trained me, you know, is sort of who I remember teaching me how to read films, they did give us numbers, you know, they said three to five intercostal spaces for the length, and I remember counting that when I started, so I guess initially I did somewhat use measurement to have a feel for it, but it is a hard thing to communicate, but it left, and you just start knowing what normal is. And I know, that’s frustrating. I wish that I could help you. I will say that when I do it with the students, and they read heart size, I tell them that the first thing that they should decide, is it normal, too big or too small? Most of them can actually do that, but what they really have a hard time with is if then if it is too big, I say is it mildly big, moderately big or severely big? We almost never agree on that one. I mean that there are lots.....but they....most the time can get normal, too big or too small, I think.

Q-12 There is definitely people who are better at that than others. I think that some of that, for the chest, is their anatomic understanding, with the heart especially. Other than that, I don’t know. I mean, some people just are better at 3-D picturing than others. I guess the thing, the only thing that I can think of that I really do to specifically get at that is from the heart standpoint. And I make them do this with their hands. And I think that it actually helps them a lot. Now, not all of them, Like some of them, you’ll see them kind of go,......and they are looking at the film, and they are moving their little thumbs around and like things are working, you know, and the rest are going, “yeah”, so, there’s great ability in it, but that’s the only thing that I can think of that I......well, and I guess the other way we do it is by,.....when we teach the patterns of chamber enlargement, the different chambers of the heart getting big, we do it on both views, well here it is on this view and here it is on that view.

Q-13 It is funny because I was thinking about saying that earlier when you were talking about 2-D to 3-D, I almost said ,“well that is that thing that you always hear that women are not as good at that at space orientation.” And I have always heard that, I mean I even remember when I was like a little kid, like I don’t know, it’s just like the SAT’s ( ) And I remember from that and then because we participated in the study, the parents were given the results, and I remember, this was at John Hopkins, and I remember that one of the results, one of the conclusions was supposedly that the women did not do as well on the part that had space orientation stuff, and weren’t as good at math, and arghhhhh! And I had always heard that. I can’t say that I notice it up in the clinic.
That is, I think, a very common myth, I would say that most people have heard that, I mean not myth but common thought.

Q-14 No. It is like, it's one of those things, that maybe there is a trend, but even if there is, it doesn't mean an individual woman isn't going to be great at doing it and you know those things wouldn't....but that's not really a true .......that's interesting.

Q-15 Actually you know what I thought? One thing that I did think, I thought, I was actually trying to remember learning how to read radiographs, I wasn't thinking much about teaching it, that's like something that I do everyday, I don't think about it, it's horrible, but I don't. You just do it, you know, it's not like something anyone ever like told me, here's how to teach......I mean I guess I watched John do it in the clinic as a resident and......but the.....I kind of thought you'd ask me what I thought was hard, what I remembered as hard about learning how to read a film, I don't know why and that was the only thing that I thought. I remember having a really hard time and maybe it is because I am a woman, Ha Ha! I had a really hard time figuring out, like when they said a left lateral radiograph, why you weren't looking just at the left side of the heart. You know what I mean? Like that really,....I had to fight with that, like well why,.......okay the beam goes all the way through them, but why would this be close........I thought that was hard. And like once you finally got past,....it was one of those things that you just kind of had to get past, and then once you got past it, it didn't bother you anymore. But I remembered it when we were in the sophomore lab, because they were asking these things that you just don't even think about, you know and they're going “well, why is this on the left......” And you're going, “Because it is.” But you know, I kind of....it brought back to me remembering feeling that way, like ( ) this place. But those are the only things that I thought about really coming down.

Teacher (Segment 9)

Q. Yes. I don't remember exactly in the curriculum when we were taught how to look at the radiographs, and figure out what was wrong with them. I remember learning real normal situations, but I don't remember when the pathology side came in until Senior year. So we learned radiographic normals, I think in anatomy and then we learned how to read abnormal ...that was put in our fourth year.

Q. I can only tell you how I made that transition from understanding what normal is and then finally figuring out how to understand what the abnormal situation is from there. I think that I learned it by looking at a lot of radiographs first, ....of
normals. They were teaching sets. We would go through a whole file and
we would be asked what are the normal anatomy areas and so on. So I
remember that, but after that period of time, we had radiographs shown to us
on slides and various demos and laboratories and so on, which I don’t really
remember learning a whole lot from.

What I really remember, is Senior year, we would go through all of the
radiographs taken
each day. Three hours, every afternoon. There were a group of about six to
eight of us and we’d just rotate seats. (On your own?) No, there was an
instructor and a big bank of radiograph viewers, six to eight seats, and we
would go through and.....no history, no information.....“What’s
abnormal?”.....and the moderator or instructor would, (this is the important
thing) would keep you
from becoming too detailed with your findings. The problem with looking at
radiographs and
learning how to diagnose problems in there is that we all had a tendency to
focus too early on what we think is abnormal and we would lose the whole
picture. And it was this instructor’s way of
having us look at the entire film. First of all looking at the technique that
most everyone teaches,
looking at the positioning and making sure that everything is contained
within the radiograph, that you want to see, (if you want to see the urethra
and it’s an abdominal film, and it doesn’t show the urethra....there’s a
problem.). So making sure that’s on the view. So you’ve got to have normals
there and where they’re at topographically, and the next thing was to begin to
look at the radiographs in a systematic fashion. Now!....that is different, that
is taught differently depending upon who is the instructor, but everyone goes
through a systematic approach to looking at the radiographs as a whole and
then...closing in on the abnormal area.

Q. Yeah. (Every time?) Almost. If I had to go by someone, and they said,
“What do you think about this spot right here?”...I’d focus on that.....I would
tell them. But if they go, “This was in a dog today, it’s got a fever of unknown
origin, what do you think?.....I would look at the whole thing
the same way systematically.

Q. No. The system now, that I use, is I purposely avoid looking at the area
of most interest. So if it was the heart, and it’s PDA or some heart defect, and
I’m really interested in looking at the heart, I purposely never look at that
until the end.

Q. Yes. Listen to this, this is important. When I talk to the students up in
the Senior clinics,
in my ward, "How were you guys taught?" They look at radiographs and get your diagnosis, "well, we go through systems." is what I usually hear. You know "We’ll look at the urinogenital and digest it, then we look at separate organs and this and that", but they haven’t gone through an actual approach to what they should do with the abdominal film and the thoracic film and a limb. Do you know what they’ve missed? They miss the outside...they miss the junction between air outside the body and the skin, are there any bumps there, swelling... they missed that! Because they don’t see that as an important thing. You look at a limb, you look at the bone, everything else,...but, the soft tissue is barely seen, if you don’t look close, you don’t see that there is a bump there. They miss it.

Q. Yes. Yes, they do. If you throw a radiograph up of an abdomen, and it’s got...the dog swallowed a penny. I mean.......EVERYONE FOCUSES ON THAT!!

Q. The ones that are gifted in radiographic interpretation.

Q. What comes to mind, you have to have the intellect, to understand what’s going on. You have to know what normal is, what would then be abnormal. There is the clinical ability and experience to be able to know when to focus on the x-ray, ...in other words there is a general picture.....when do I say, “Okay, I’ve looked at everything else, and now I’m going to look at this one area.” How to take the clinical findings and pinpoint on the radiographs, where to look at a more focused area. There are all of those things, which means that they have to be able to apply well.

Q. Those students, particularly are what I would call, "the clinic hounds." They are the students that have had some clinical experience and have been around people who have read radiographs before and they understand how to do it. "Why," Dr. Smeak, "did you look closely at this area. I would never have seen that."....Because of the history and physical we know that this, this, and this, is important and the most common thing that we see with this kind of history, is this diagnosis, so I am going look at these areas rather closely, because these are sometimes very difficult to pick out.

Q. I have had people in middle range who have been terrific at it. They are the ones that appear to be more clinically oriented, more mature. I can’t say the older ones necessarily. It appears to be that way.
Q. Yeah. I do believe that’s true. I believe students, women, have a harder time with spatial relationships than men do. I really do.

Q. I guess that could go back to whether they played with Legos or not. It could be.

Q. Women seem to have a little harder time being able to turn things in their mind so that they can figure out a lesion or not. I had a couple of students that I think Schrader has now, that one is way down there, ...can’t figure out top or bottom, right or left.

Q. I think that is why radiologists standardized how you place radiographs on the viewer. Because it is different between places. Some people say,....you’re looking at the animal and it’s pointing always to your left. Always to your left.......Some places say “to the right”.

Q. You teach normal by giving examples .....many examples of normal. Not just one radiograph, and say, “Okay, I want you to study this for a week.” Now you’ll know normal? They’ve got to go thirty of them. ....and then throw an abnormal in there and “WHOA!” This is different.

Q. Well, let’s put it this way, They have a set that are normals with a couple of.....that’s the way we were taught.......a couple of abnormals in there. You go through a bunch of normals, after a while, you can look at that and say it’s normal, because you have seen that many. I think that you have to see a large number of what’s considered to be normal, before you can tell what’s normal.

Q. Maybe to explain in detail what we consider to be abnormal appearing regions. What I’m saying is, that would only be affective if you know what normal is.

Q. Let’s put it this way. It doesn’t make any sense to me, because they are not going to learn it that way. I don’t think.

Q. I’m not sure if it was the group effort or not........ The(seizure) that really made me I think, more accomplished in looking at radiographs. But I will tell you this, there was some pressure that you didn’t look stupid. There is some of that.
Q. No. I don’t think that’s all of it. Another part of it is that when someone else is looking at a radiograph and having a little difficulty and asking questions, most everyone else in the group probably has the same question. They are put on the hot seat, but whenever they are, “I thought the liver looked a little large here,” “Well, why did you think that?” “Looking at the stomach axis” “What do you mean by stomach axis?” ”Well, it’s this, this, and this.” No, No, that’s not what you mean is it?” It is all of that, in a small group, I think that you feel reasonably comfortable that what you say isn’t going to get you into too much trouble, and make you feel too stupid. So there is some pressure there, but I think in the small groups those people are more free to ask questions and to learn as a group that way. And I might say when that other person is up there looking at the radiograph, “I didn’t see that.” So there is some interaction there that I think is important.

Q. It depends upon the detail of the radiograph. It depends on where it is, and how much detail is in the radiograph. If it is in a focal area around one tooth I think that you would get similar findings. But if you have a whole abdomen to look at, I think there would be some changes in interpretation. But overall, I think that there will always be some people that will have a little interpretation than someone else. That goes along with it.

So what I’m saying is basically, that you are not going to ever get everyone to think the same.

Q. Slightly. I think that the person can still get a lot from the interaction, because a lot of the questions are the same ones that someone else poses in with what I had. I think that you have to take that question in relation to what? In relation to a lecture? Or to a one on one session? You know what I mean? Are they at a disadvantage if they are in a one on one? In some ways yes and in some ways no. I think that they would be more apt to ask perhaps, but they wouldn’t have the interaction of the other students asking questions. So, I think slightly, but not a great deal. There are always people who talk out loud. But I think that the silent ones still get a lot out of it also.

Q. I think that most people have tunnel vision, and that to be really good film readers to get the whole picture, (1) They can’t focus on things too early, in fact if you are going to pick an area that you think is the problem, wait until the end to look at it, which is probably the most important thing that I do, that I suggest that people do, and (2) develop a usable systematic approach to looking at radiographs. Now that is probably no different than anyone else, but it’s probably different for every person. You have to develop that, and understand your weaknesses. My weakness is that I jump into things way
too quick. I am quick to make a judgement and so on. That’s a problem. I was taught to avoid that by doing this “avoidance technique”.

**Q.** It depends upon a great deal of things. The most important reason that I take radiographs is to point me in a direction to handle the problem. There are a lot of different ways that you can view that, one way would be that, maybe it is to confirm something, but to confirm it is going to lead you into looking at other things that may have to be tested for and so on. So to confirm something, to see if there are any additional problems present perhaps, to direct the therapeutic options in a certain way, ...for example radiographs of the chest, or whatever and the dog has metastasis, we wouldn’t go to surgery in some cases and maybe we would in others,...sometimes it is to cover our asses, lawsuits, .....sometimes it is for teaching, almost totally, in fact many times it is.

**Q.** Nothing. Nothing.  (Why do we do that?) For the medical record.

**Q.** No, because the only time I search for a radiologist is when I have questions. And I go right to them. Right now, this is it. “I’m concerned about this area. Buchard is not, but I’m really concerned. What do you think?””.......”Oh, you don’t think there’s a problem either, okay.” Or maybe you think ultrasound may be indicated next,.......I’m looking for them to answer questions, I don’t ever look at the reports, I don’t think. The only time I ever look at reports is when they say something, ...they agree...I go in, something is not quite right.....we go back again, and I go, “Hey, there wasn’t anything there. Your report didn’t say the same thing that you told me.”....one of those kind of things. But that is very rare.

**Student (Segment 10)**

**Q.** Well, basically they, include them in the lab portion. And that pretty much, .....well most people ‘s first exposure to radiographs is during that lab period. They just kinda throw them up there and they don’t explain them, no one goes through them with us, we don’t see them in lecture first or anything like that, ...it’s just that they are put up on the side and it’s our responsibility to walk around and look at the non-labeled, ....anything that we need to know is labeled. And you pretty much can’t figure it out. There are a lot of problems, I think with...ah, ....like with the different views, you know, and how......they don’t explain that to us....like...ah....how the pictures
kick in and what you are actually seeing in terms of both sides, and like what the light and dark represent. They don’t go through any of that with us, which I think is a problem because it is just, ....it would make so much more sense if they could do that I think. They pretty much just put them up there and say okay, “here’s your scapula, here’s, you know....the different parts of the bone and stuff, and you.....everybody just kinda memorizes the, you know.....the labels. So, and then,...sometime later, they will put the same ones back up, usually that you have already seen before, and you pretty well know it,......so it is not difficult in terms of them.

Q. I think that it depends on the person. Because I think that a lot of people are really in tune with that....really in tune with putting things together, .....I mean, they want to get across that that’s what you are supposed to be doing. And I think that they kinda take that for granted.....I think that some students do think about it that way....ah.....but a lot of students just walk up and look at it, memorize it and walk away, and don’t even think about what they are actually looking at and how it relates to the animal on the table. Because you see, we don’t do a lot of clinical stuff, which I think is another problem. Because the thing I like best of all in anatomy in terms of the lecturing, and learning are when we have a clinician come in and like....show us pictures of things and, ....You just try to think about........and even for me, after three years of doing this, I mean it is kinda difficult to just look at something and say, “There are so many things that could be going on”,.....but that’s what gets me thinking about this stuff. And how everything relates to each other.

Q. Well, it seems like the A student, you know,......they are just going to do well. The people who I see do well in Anatomy, do well in anything else. Anatomy is a little bit easier than some of our other classes........well, that’s my opinion. I guess.....uh.......yeah, I would say so. Very straight forward, it is mostly memorization and I think that most people find that easier. And you don’t have to .......I mean, it may not stick with you as much, it’s very straight forward,......and even the exams are like regurgitation kind of stuff, you know they don’t incorporate a lot of clinical things into to get you to think about the anatomy in that way, which again .......for the most part it’s people that do well, just do well in everything.

Q. Older students do better......There are more older women, just because there are more women in general but........

Q. Really?........I’ve never heard that, ....as opposed that they would do better with.....Like?
You mean the actual gross anatomy or radiographs? I, for me, if I can see something, and visualize it, and that's why gross anatomy is easy for me, because I remember it, just by looking at it, and I try to do that with my other classes, even like the molecular stuff and things that I don't have a clear picture of. I try and make myself get a clear picture of it, so I can see... if I can see what's going on, rather than just like reading words and trying to do it that way, I mean...
That's the way I learn. And that's why I really like Anatomy.

Q. To a certain degree, yes. I think that it is most just study habits. No taking the time to... I just have a couple of people in mind right off the bat that I know very well, that it is always a last minute thing, and it's always run through the notes really quickly, not taking the time to look at the words, look at how they are spelled, look at... you know, in going over it, it's a lot of repetition because it's memorization, and then it's what they lack. They just don't take the time to sit down and spend some time on it. But...

Q. I mean...... I think that they......like or tend to do better in more, I guess...... conceptual stuff,...... more ideas or...... uh...... I don't know. We just had this...... and part of was...... uh...... like a lot of stories, and I felt like I was taking my GRE's all over again, like the English GRE's? You know..... with these stories, ...... and you really have to draw out information from that, and then there was a section on,...... it was more straight forward stuff....... kinda dry, and it was stuff that you just had to study...... and it wasn't hard. And I felt that that was easier to me, I could look that and learn and this other person thought that the other part...... not that she did better on it, but she just liked that more, that type of information rather than the straight forward, dry, factual kinda stuff.
And I think that it is a difference in personality and...... if they wanted to, they could do it.

Q. Um...... for the most part, yeah. The bones, for me are always the worst part, in imagining. Um...... Well,...... Yeah, but you don't see them when you are doing the dissection. Which is,...... I think,...... what it is. Because you see,...... very rarely do you actually get down to the bone, you are seeing all the muscles, we do all the muscles, you see all of the vessels and nerves, you see all of the abdominal organs, and heart and all of that, and that's what sticks in my mind,..... I mean...... granted, we have skeletons around the room to look at, but you don't see that...... I don't know...... I have always like...... tended to shy away from...... I mean I look at them and I know them for the exam, but it is still always hard for me to go back to the actually body and go through...... and like
kinda.....trace the......I mean, I can do it, just from all the time I have had to, 
....but I think that that is the hardest part and I think that it is just because you 
don’t ....I mean, for me......not really getting to see .....you get a general idea of 
where......well the scapula is in this region, kinda at this angle, and then the 
humerus comes down and that.....but......and there’s so much to.....I mean 
there are so many little bony prominences and things that they want you to 
know or that you need to know for an exam, 
and what muscle touches where, and it’s just....it kinda....I don’t know, it’s 
just not something that really sticks in your mind. I mean, right now....I’m 
picturing a femur rather than a humerus, because I can’t distinguish right off 
the bat, the difference in the top of the humerus. Like the femur has this 
very prominent head and the humerus is like.....I don’t know.

Q. Because, they are thrown together, they’re from all different animals, I 
mean.....you may have a humerus this big, and then you will have a radius 
this big. It is that you get no.....idea of what is really going on to articulate 
them together and .......um.....some of them are, you can do that, 
but um...

Q. They don’t feel like bone structure is emphasized at all. We get 
questions on an exam, but it’s not the main focus. And you know it may be 
......I always felt like coming into this there should be a course in radiology, 
where you actually learn how to read radiographs. And, when I first came 
here, I was really surprised, to have these things thrown up and say okay, 
“just look at them and know them”, because....to me,..... it’s like if I try to look 
at an ultrasound or something, I mean 
.....it’s like the same kinda thing. You need like some kind of course in how 
to read these things, 
because it looks so different. And maybe if there ......if we had....I mean, I 
don’t know how they could that unless they just had a......during the 
dissection you actually put more emphasis on getting 
down to the bone and seeing where things are attached and what.....a more 
clinical aspect as to where things are.........I don’t know.

Q. I think my background will definitely help me,......up....I had a hard 
time.....I mean, I can figure things out generally, but not enough to say well 
there is something wrong there, because I have looked at radiographs of a 
forelimb where......I can’t remember at the time whether there was 
something wrong or not but you know,....I couldn’t tell if that was abnormal 
or not, just the way the bones were laid out, if it was abnormal, if there was a 
fracture there, I really couldn’t tell, and even I have my cat, who swallowed 
an ear plug, and we took x-rays and they’re like “Oh yeah!”  
Like it was right there, and I never would have see it. And I don’t know,.....I 
mean...I could get an idea like where the intestines were and kinda you
know......where the stomach was, in relation to things but,....you know,......we
don’t learn about the lightness and darkness and you know...what air looks
like on a radiograph ....or what a solid structure looks like, I mean....I don’t
understand that.
I don’t understand the concept of how it happens and maybe that would help
in ......I’m sure that would help in reading them.

Q. Generally, it is pretty good. Up......I think people tend to like canine
anatomy more, with the groups because there are three people in a group.
Equine, we have six people in a group, and
it is a little harder to get in there and see what is going on.

Q. Oh yeah. There is usually , and this is usually by personal preference,
you know, there is always someone that really wants to do that, that is really
into dissecting and there is always someone who doesn’t really care and there
always seems to be a leader.

Q. I think that they just ......it just kinda happens. I don’t know, ....I
mean, because you don’t know anybody going into it, and some people are
just shyer than others, and whoever is kind of
digs right in, then they just sorta take on that role of being the one who
always initiates things.

Q. Up......Sometimes. I mean there have been, .....I have had some people
come to me this past quarter, who have told me that someone in their group
is takes over, is really bossy, tells them what to do all of the time, and
criticizes them for what they are doing, and so,......I don’t believe that the
majority of the time that it’s like that. Usually, everyone is pretty okay with
it.

Q. I think that it is better to work together on it because it kinda forces you
to do what you need to do, and I think that you just get more out of it. Maybe
that is not too realistic, but I think that it would be better. (Why?) Because,
like I said, it forces you to.....I mean....you have to do everything yourself. I
mean......that’s pretty much what I did when I started. I didn’t have any
direction at all other than my lab book, I was pretty much just put in there
and told to go to it.
I felt like I really learned a lot, I was very attentive to details, reading along
and getting an idea of
where you need to cut, and it was more thorough, and I really think that you
miss things when you are alone. Because even now, when I teach, I like to
do a review but I always feel like I’m missing something because I don’t have
my own dog to look at, because the second year that I was here, I didn’t have
to do a dissection but I was doing something for the ( ) and that was
such a good review for me to do that myself. So now I feel like before I go into the lab, I gotta like look at you know, something...even if it is somebody else's it’s still is ...like it’s not that, ...I mean it definitely helps me but, Like if it was my own dog that I had dissected it would be so much more helpful and I would just feel more comfortable with it. So, I think that there is something there in doing it yourself, and even like the elective class that we had, where some people could dissect, but everybody had to know the material of food animals. Generally the people, I think, that did the dissection did better.

Q. Yeah, I'm not very aggressive......(So you've had that experience in groups?).....in being...like when I've wanted to say something but didn't? Yeah, I think that I have had that experience.

Q. That's just like the AT slides. I like to sit there by myself, and look at the slides, and read my notes and go through it, whereas if I am in a group, I just feel like........I can't learn this way. That's why I never.... I'm never in there when I'm scheduled. I come in on weekends or at night, and do it by myself. And that is the way that I learn. That's basically with all of my classes, everybody is trying to get into study groups, and the teachers really stress how, you know, this is really good to get together and talk to people and this and that.......but I can't do that. I mean, I think that if I know everything, or if I feel so comfortable with everything, and I am completely ready then I can get together and talk about it, but if it is like we are sitting around and I've run through my notes, doesn't help me at all. I have never gotten anything out of that.

Student (Segment 11)

Q1:

In anatomy, they have radiographs....as you're studying certain parts of the body, head, leg, whatever, they have...there's usually always a few up there, and they're tested on. So while you're learning , you know, the skeletal system, you can see a coup...not of everything, but there's a few things there, maybe with abnormal...abnormalities, usually they're normal, though. So you can see the normal. And that's always interesting to see what...to see the bone, and then you can see the shadow, too....on the wall.
Q2:
No, it's during the practical exam. They are up where they were. You know, throughout the lab time. Arrows will point... what part of the bone is this? Pointing to...

Q3:
Yeah, I'm in a study group, Thursdays.
I guess I didn't study anatomy with those people.
We have looked at radiographs in our group, though. In cardiology.
We got... a pathology type person, got a ( )... he's probably the brightest person in the class (ha ha) or in our study group, I mean... about four regulars. (the other two are) average. Small Animal...(Q) three women, one man. (my interest is ) mostly small animal and equine... both.

Q4:
(naturals) I don't think, as far as radiographs. We were all kind of coming into that in the same level. I don't... as far as I know, noone's seen a whole lot of them before.

Q5:
I could say one of the four was really weak at it... but the rest were about the same.
Because the one person would often.. um.. I don't know... I would say this person was more likely to misinterpret... what she saw. So if it say... the heart was enlarged.. or maybe the heart is normal, the person would say its enlarged. You know, that kind of thing.
More false positives.. seeing abnormalities that.. weren't maybe there.

I would say.. "I think"... I would say something like "I think it's more like this.." or maybe this is normal, but this isn't what's normal... or maybe what you're seeing here is really because this is big or small...
Q6:...

Well, it's all part of the process, perhaps. But what I...when I really started to put the things they're talking about together, we had it in cardiology and respiratory, we see all these slides, see this pattern, see this pattern, see this pattern, and...another thing that made it difficult, our notes weren't quite in sequence with the lecture and what was up there, so for me, I like to hear it and read it too, back and forth, and that's how I put it together...so when I couldn't hear it and then they're showing it and I couldn't quite read what they just said, or...It's hard for me to learn that way. But you saw...if nothing else, we saw lots of chest x-rays...you know, even though we couldn't maybe tell differences, but when I really got it was when we were in a lab...and it was all up there, and you look at each one with a description below, what's normal, what's abnormal, and normals to look...compare with that. And then all of a sudden I really saw...that's what they've been talking about in lectures...that's these patterns, these....you know....

It was for me. For the basic things they're trying to show us. You know, there might have been eight...um...types of things they were trying to show us. Lung pt...patterns you could see in the lungs...and you know, we talked for an hour or two on that in lecture...and I didn't understand what they were talking about...and then when it was there, all of them together, at one time, and you could...when I was confused between two I could go look at the two...and I really remembered it that way...I mean, I had to kind of go back a little bit, later, but...a couple of weeks later, right now, I think I remember the difference.

Q7:

Yeah, that's it...I couldn't go back and compare. This is one pattern, and you've seen one, and then you see the next one, and it's...well, how was that different from the last one? But you can't flip the control back and see what that last one was, and say "OK, I see what..."

Yeah, I get a lot of people coming out of there and being like, "I didn't learn a thing", or "I'm really confused now", that kind of thing.

Maybe 'cause you have to start somewhere. But...

What they did in the one lab is that we wandered around and looked at it without an explanation, and then we got the explanation and we could wander around and look again.
Q8:

(women) I couldn’t say that.

Q9:

I think I get a picture in my head of what...first you get a picture of what’s normal, and then I get...and then so I can look at different things and see what’s normal, what’s not normal, then I kind of get a picture in my head that I associate with the different conditions or patterns...

I don’t know...cause they don’t show us a lot of normals sometimes. So sometimes you’re not sure...so your normal will come up

Or I see a picture of a heart and I see this heart is long...but I can kind of picture when the abnormal’s up there...I can picture where the normal would be...

The size of the heart compared to the chest...itself...you know, if the chest is this big and the heart is this big...compared to this big, ...I think that’s how I do it.

It’s gradual.

Q10:

When I have a question, I’m not sure, when I see two things and I can’t see a difference, they can be there to point it out...or define it. For some people, there was a ...I guess it was in respiratory...had a bunch of diagrams, and for some people that really helped them, but that didn’t help me as much, some people were copying it down, and stuff...and I didn’t ...I didn’t like it... and I didn’t want to look at it, cause I didn’t like it ..it didn’t...I tried to put it together and I didn’t like it, I just wanted to keep what I ...I don’t know, for some reason that day ..couple days of lecture, I just got it.

I had already figured it out somehow, and trying to do what they were doing.....

In my group of four people...there’s certain things...pleural effusion... and some people in the group...one person in particular, couldn’t...would never see that the edge of the lung lining was pushed down, there was fluid between the lung and the body wall, ...that’s something I..I always saw it, but some people that I’d be working with would have a hard time seeing that edge...that’s the kind of instance you mean?
I think I caught that a lot, but um...but it was something that a lot of people weren’t catching...and I couldn’t understand “why can’t you see that” because it ..well, I could see it. But...um...

Yeah, and once you take your finger up there and point out the line...the people in my group could see that.

So far, radiography is going OK for me. And once I get into clinics where you really have to point-blank figure it out, maybe I’ll have trouble with it.

When you have a history, you can right away start looking for things, but maybe that’s not good..maybe you look for things that wouldn’t be there.

Q11:

I don’t think...from what I know thus far...I don’t think the answer is always there. I think radiographs can fool you. ...could make you think there’s something there that’s not..or something’s not there.

(mentions ER as example of popular use of rads)

The public doesn’t know anatomy....and what’s inside, and where it goes...so it looks like greek...I mean, it was greek 2 years ago when I came into vet school and didn’t know anatomy, and the vet I’d worked for would throw them up and see..Oh, there’s the stomach, the diaphragm, blah blah blah, and (he’d say) can’t you see it? Nope...but it looked good. Looked impressive. (laughs)

Q12:

Yes, I’ve experienced that. One example is that we have these () cases we have to do for cardiology. And the last case we had, there were a lot of radiographs that you had to look at, consulting with your group, and you didn’t get to pick your group, so...you know...I didn’t always enjoy that...some of the people...wasn’t....you know, we didn’t always work together...but we worked fairly well together, we got the job done. But I remember one particular radiograph was really tough...and we had some people thinking this and some people thinking this....I was thinking, you know, I had one opinion more so than the other, but both of them to me seemed reasonable...it could be defended. But then it kind of comes down to what goes on the papers, who’s the most assertive person in the ..pushy person..to write it down. That
kind of thing. But (I saw the book) it was neurological. Even though I liked one better, they were both readable, could be interpreted both ways, and in the end, that was the answer. I mean, there was one answer...I was the wrong answer, but the instructor said both of those could be interpreted...it wasn't a wrong answer to say that.

Q13:

They don’t know how..they don’t know to..interpersonal communications. They have an opinion, they don’t know how to say it in a way..you know...if I have an opinion, I’m going to say it like “I think it might be this” or “I’m getting a feeling it could be this” or “What do you think about this”...not saying “It’s THIS. It’s gotta be this”...that kind of thing. So those pushy people who have an opinion say it’s this and the group’s used to hearing the other ideas...

I’m picturing two men in my head. (laughs) That’s not fair...I’ve had more male instructors....

My thing with radiographs is that the lectures weren’t that helpful, I learned it in lab.

Transcript 12:

FS2: yeah but do you think the um
FS1: // cranial ve uh
FS2: [caudal vena cava] a little distended?
FS1: [caudal vena cava]
FS2: you can see it better, but i im just wondering if that s the contrast you have on it

FS1: I've a really bad habit when i look at xrays if theres something on there that im not sure about i pretend like its not there
FS2,3,4: (laughter)
FS1: cause i just look at it for the second time i didnt even see it so ( )i just blocked it out of my mind
FS2: i think it could just be summation cause that. apparently. i mean i dont get this but like uh the arterys just torturous and i remember the one in class it was like. snakin
all over and i didn't think it got that big and whatever and i

Transcript 13:

1. What's going on here? That's the trachea.
2. Look at that heart.
3. Four months old, female German Shepherd. Dog was presented to OSU for treatment for distemper. The distal heart sounds were difficult to auscultate. Jugular pulse appears to be present.
1. Is that that basketball heart that we saw?
2. Pumpkin heart?
3. Generalized overall heart enlargement. It's only a four month old, being treated for distemper.
1. Is the heart that big, or can we just not see it because of fluid?
2. It's big. Do the lungs look normal?
1. Yes.
2. Well, they look to me like they are thin,.....
1. It's pushing them. Okay, whatcha got?
3. "The cardiac silhouette...........
1. Is that film upside-down again?
2. Oh my God! That's it! Sorry!
3. No wonder we can't read these things........"Cardiac silhouette is markedly enlarged, and round on both views. The trachea is dorsally displaced. On lateral the ventral portion of the heart and diaphragm are obscured probably due to free pleural fluid. There is no apparent bulging in the region of the left atrium on lateral."
2. Okay. Sure.
3. "The dog is diagnosed with pericardial effusion. All causes of pericardial effusion should be considered including septic pericarditis and congenital pericardial diaphragmatic hernia.
1. That's a good one to have.....he's only four months old.
3. Basketball heart! Big heart!

Transcript 14:

B: You want to (......)
S1: The one on the bottom?
We have a cotton candy appearing lung, which can be indicative of pulmonary 'metastases....
B: pulmonary metastases...ok
S2: (What does cotton candy mean?)
B: well its interesting...pends on who it is and what it is they mean by cotton candy. Some people use that just as a generic term. that means that there are....well, what does it mean to you?

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S1: it means theres.....a.....cotton....candy.......  
       ((entire class and instructor laugh))  
B: thats why he took swahili.

Transcript 15:

S1: (...) does it come down..is this..like...is the artery here..and the  
    trachea’s..going..on that side of it...ssz the artery’s gn come out, you  
    know, straight...if..I thought it wrapped...so and so...  

B: Ok...well...ok....what, what directions can you see in this X-ray?  
S1: the..uh..two..haha  
B: which two?  
S1: dorssalandven  
B: Give me their precise names./  
S1: cranialan caudal  
B: Ok, where’s cranial  
S1: left  
B: OK, cranialandcaudal, and what else..what other dimension do  
    yousee  
S1: (0.5)up  
B: where’s dorsal?...where’s left and right?  
S1: (0.3) you can’t seeit but that’s what I just had ( )  
B: thats right..but you can’t see it cause it’s..that’s in the plane of the( )  
    the elevational plane, so..it is ABSOLUTELY IMPOSSIBLE to say anything  
    about left and right on a lateral xray..because if its not in your  
    plane...now, I can tell you that PROBABLY if the dog was laying on his  
    right side for this xray, PROBABLY that’s the right crus of his  
    diaphragm...that’s how it usually works out with the radiopaque  
    markers, that’s usually what it is..but but you..there’s no way that you  
    can consistently know anything about left to right/  
S1: / yeah, I realize you can’t know that, I just wanted to know that in my  
    head so that I know what I’m looking at.  
B: Ok...well, the trachea, for the most part, comes..down..the  
    mediastinum pretty much near the midline doesn’t it?  
S1: umhm  
B: it deviates a little bit to the right...kay? but then where does it end?  
    where does the carina originate/..relative to the heart?  
S1: /well it  
S1: it appears below the aorta..like  
B: kay..whyncha show me where it is?point it /out to me.  
S1: /(....)  
B: /no, point it out to meon on theoneone the left...
SI: (laughter)
B: /that one's all labeled...
SI: and um..id guess like um..in there/
B: /that's exactly right..so where's the aorta?
SI: here
B: /there you go..that's fine.ok..and..so where's the dorsal border of the trachea?
Show me the dorsal border of the trachea..for its entire extent...ok?..there..keep goin,keep goin, oh!..now what's that.ok..that's the carina..so what's the continuation there?
SI: well...
B: /what do you think that is?
SI: Its over top of one of the ( ) goin into the lungs, its just the bronchus/
B: /Well, that's actually the left main stem bronchus..the very..this very proximal part, right here, from here...to there...is left main stem bronchus/
SI: /ok
B: then it continues out to the caudal lobe, cause that's the biggest lobe in the body/
SI: /oh ok
B: but it also..its comin out of here..see the bifurcations ..that little donut right there. That's one coming out at you.there are others going other directions you can't see..thats the right main stem bronchus, from there to there/
SI: /that one (....)
B: (That donut right there?)..not a very good donut.. (Aside..I'll be right there)/
SI: that little teeny pea thing?
B: /yeah, that ...
SI: / ok..alright
B: /its.its.a small segmental and may be (...) you can see a bronchus..you can see the wall of the bronchus right here/
SI: /ok
B: /ok? So, the way to think about the trachea in this view is simply that it is located in the dorsal mediastinum..even if it were deviated to the right or to the left you would have no knowledge of that..if you look at a bulldog trachea...those babies come down ..if this were a ventrodorsal view..they come down like this/
SI: (laughter)
B: /but you can't see that on a lateral view.sometimes if
its deviated up or down at the same time you’ll see it has a little kink one way or the other...then you look at a VD view and its going like this...and so um...you have to have complimentary views...um...the left atrium is here...alright? So, can you imagine that if the left atrium got very dilated...it would push up this left main stem bronchus...ok...nas it pushed it up it would hit the bottom part of the ventral border of the aorta...n that would be where...and that’s how it gets mashed. You watch these on the bronchoscope, what you see is you see that every time the heart contracts, the left atrium fills and gets big, the aorta expands the bronchus gets mashed, mashed, mashed, every beat...so...um...

S2: I was just wondering, you said the left is...supposed to persist, right, but if the right persists...then...um...the trachea kinks...would you say the trachea (.............)
B: /you’re talkin about the aortic arch now/
S2: /yeah, the aortic arch
B: /that’s different
S2: /the..no the ductus ar...thu...um../
B: /ligamentum
S2: /The ligamentum arteriosum, yeah...that...you could just cut that...if it persists, right...and you have to cut that because...er...uh...the (...esophagus)
B: Well, not around the esophagus...yeah...around somepin...thats right...what...where’s the esophagus located here?
S2: (.5) ummmm...right there...dorsal to the trachea....
B: /(..)you can’t see it...it doesn’t have any air in it...no natural contrast for you to see it...so...what...this is a totally different issue, but if you have a persistent right aortic arch as opposed to the normal situation of a left aortic arch...and the aortic arch goes into the right...it winds up being on the wrong side of the esophagus/
S2: /alright
B: so if heres the...if you gimme some pens I can show you...gimme...actually, I need pens...um...heres the...make this the descending aorta, ok,
S1: /umhm
B: Ok...um...make this the aortic arch, ok...and make this the esophagus, alright?/
S1: OK
B: If the aortic arch comes from the left, goes right into the descending aorta, the esophagus is fine...ok?,...but if the aortic arch comes from the right...

S1: (mumbled)

B: it crosses over the esophagus, and the esophagus gets trapped..like this ...between the aortic arch and the heart face cause this is what the heart face will be underneath all of this...

S2: /Oh, ok (garbled)

B: /and then...and then..its...what I can't put here is the pulmonary artery...pulmonary artery's still over here on the left?..so what's the connection between the pulmonary artery and the aorta...its the ligamentum arteriosum...so if you cut that ..and you dissect...you can pull the esophagus out, you see, and thats what I was talking about ...the aortic arch still comes from the right ..you basically/

S1: /yeah, right

B: move the esophagus out of the obstruction...ah..and you'll study that later...and actually I'll bring a cat specimen in that has that lesion and ...might be a little more obvious..but um..thats what I was talking about.

S2: My doctor says that my aortic arch goes to ..somewhat to the right ...

B: Well actually, its very interesting ...people...is that aortic arch in people, and its relation to the esophagus is very different.../and they rarely

S2: oh, okay...

B: ever have a..an esophageal problem with the right arch./

S2: Oh..okay...

B: its usually not a .../ big problem

S2: but the aorta basically comes out and goes straight..its like, dorsal...

B: well, it does, but what you have to remember is that ...in the fetus, the arches are paired...its a hard concept, but ..there are actually..theres a ventral aorta, aortic sac...theres a dorsal descending aorta..but instead of one arch coming out of the fetus, theres two parallel arches coming out..there are six pairs of them..and thats what produces all those various vessels...for example..the ductus ...is the left sixth aortic arch..the left subclavian is the left third aortic arch...the definitive aortic arch is the left fourth...if the right fourth persists and the left fourth declines, you get a vascular ring...uh...the seconds go away...some become some things called intersegmental (...) but the point is that ...is that ...theres a very well developed arch system..slike fish...fish keep em...alright..and so...um...the developed arch system is responsible for forming your major blood vessels in the thorax...and if they dont form in the right way, then ...other structures can get trapped by them ..I mean, there are things called double aortic arches, there are left aortic arches with right ductus arterioses, and ...theres a whole bunch of weird things, but ..the one thing that s most
important to know is...the persistent right fourth aortic arch...and that’s the most common vascular ring anomaly you’ll encounter...in practice...and that’s one that’s surgically correctable if its diagnosed quickly. Cause you won’t diagnose it till they’re weaned, cause the milk will go down the esophagus even when they’re partially obstructed...but once they eat food...now they’ve got Purina dog chow stuck in front of their heart...cause the...they can’t get it down....

Transcript 16:

think, when you are first confronted with these things, to kind of come to grips with these issues.
If we take this situation, if this is normal, if this is properly exposed, it receives the proper amount of exposure. Is this over-exposed or under-exposed? A....over-exposed? B....under-exposed? Good! B.....it is under-exposed. Why? Because it is more radiopaque. The beam didn’t get through it, didn’t expose the plate. Do you see that the mere over or under-exposure makes the bones just right. If we take a different normal, then we might wonder whether or not this bone has lost minerals. You see? Because it is more radiolucent. We’ve got to determine, from the very “get go”, when you are examining films, that this is properly exposed because it leads you to make decisions about what you see. If this is normal, then that is under-exposed.

The issue of radiographic anatomy, what is normal and what is abnormal, is an extremely difficult subject. And there is absolutely no way that we are going to be able to cover, and have you feel comfortable with normal radiographic anatomy in the horse, cow, dog, cat, in a whole course, let alone in a couple of hours. People have spent their lifetimes as veterinarians, trying to ascertain, “Is that normal or abnormal?” You’re not going to do it quickly, and you need to be patient with yourself. It will take time, and part of what we will do in this course is to try to provide you with as many normals for comparison as possible, so that you have a fighting chance to determine what’s abnormal. I’ve given you some references there, Thrall, ( ) and Wilkins, ( Mybioshi?) And I hope that you would use those references to work on this issue of normal radiographic anatomy. You’ve got to know what is normal before you know what is abnormal.

Now, interpreting the radiograph. We will talk a little bit more about normal and abnormal tomorrow. But we talked about some pre-radiograph considerations, we talked about making the radiographs, properly exposed, two views, subject close and parallel to the plate,...those things are all essential. When it comes to interpreting the radiograph we’ve got to know what is normal, before we know what is abnormal. We need to remember that radiographic images, are only two dimensional and that causes some
frustration and problems. Here is an example: And this is an example of summation, this is a medial lateral projection of the foot of the dog. This is a dorsal palmar or a palmar dorsal. We don’t know, this could be a lateral medial. In this particular view, medial lateral or lateral medial, notice that most of the metacarpal bones are superimposed on each other, they are summated, and it is very difficult to pick out one from the other. This view gives us a better appreciation for the individual bones. Now that’s not reason enough to take this view only. Because there can be problems with these metacarpals that are only detected in this particular view, but summation is an issue.

We talked about magnification and distortion and here is a good example. This is a normal radiograph of the pelvis, rear limbs and externa of the dog. This is what is called a ( ) projection. This was an attempt at the same film, what do you see? Well, you see that the length of this femur is not the same as that femur. You have to decide if that is normal or not normal. Is it a matter of positioning or is this femur really shorter than the opposite side? Here you see the lesser trochanter. If you look at this lesser trochanter, it is right here. A little bump, you don’t see that here. This neck shaft angle looks more open, that is there is a greater angle, a more straight relationship than this side. Is that normal, or is that a function of positioning? This dog happens to be painful on this leg. Guess what! It could be the leg down, parallel and close, So, distortion and magnification. We have gone through this before, remembering the various tissues, remember that water is synonymous with scar tissue and cartilage as well. We use these terms, radiopacity and radiolucency and the amount of x-ray that gets through a particular subject is going to determine the blackness or the whiteness, the radiopacity or the radiolucency of various tissues. Now remember that we can use this in a diagnostic sense. Here is an example of an animal that has fractured his back. And this is the repair that we did. Look for the various radiographic densities. Air, this air is very well demarcated got a nice margin to it. It is air in the bowel. Here is the back, a little more ability to stop the x-ray, you see? Radiolucent, a little bit more radiopaque. Here is the caudal margin of the kidney, and here is the bowel wall. Why can you see them? Because they are different tissues up against each other, there is contrast. ( ) This is soft tissue. This is water density. ( ) This represents from here to here, in that line, represents ( ) Notice that the musculature in the center of this vertical body, there is not much difference in radiopacity there, this is a little bit denser, this is cancellous bone.

These ( ) radiopaque lines are tarsal bones. They are more dense yet, and look at the metal, it stops just about everything. There’s nothing ( )

Transcript 17:

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1. Okay. Looking at this, the bone looks very--not dense, to me. Up here it’s like, it looks pretty smooth though, you’re looking for a margin. (Bad portion of tape!! Impossible to understand) (Are you driving home?........Be careful)

(MORE NOISE)

1. It looks like the bone is like, coming and curving in and it looks like there’s a depression right there. I don’t know. I don’t understand why this white line is here. Kinda like a white spot in there.

2. "IM" cavity? Is that a certain cavity that I don’t remember?

3. Hmmmmm....and then there’s ..........the IM cavity looks a little bit fuzzy.

2. Inside the bone.

1. I even caught it...intramedullary.

2. Takes me awhile!

1. Okay now. Another question. It’s a one year old dog, so technically, it shouldn’t have growth plates,.....right? Or will they still have growth plates?

2. Probably depends on how large they are, right?

3. You can see that and you can that,....especially for a Doberman, I think they still can.

1. I mean, why isn’t there a growth plate there?

3. Hey, aren’t the German Shepards the only ones that are supposed to have a growth plate there.

2. I don’t remember. Why would they have a growth plate there? Is that a growth plate?

1. Where is the coronary ( ) process?


1. Where is the (ank......................)?

2. Oh really? I thought that it was somewhere in the joint or close to the joint.

1. I don’t know. I’m not disagreeing with you, I just don’t know.(

Okay, then what’s the answer. Let’s go that way.

2. I was just thinking, once a growth plate has mineralized in, don’t you than see a line? Or not?

3. This is a growth plate. So I guess that could be. Yeah that looks like one. It looks like some kind of growth going on there.

1. So we think that the scapular and humeral joints look normal?

Right?

2. Yeah, it looks like,.....round.

1. That first one, do you want to read the answer?
3. Yes! It's long, Oh my! (Reads....."The right shoulder joint is radiographically normal although evaluation is impaired by underexposure.............)
1. "Underwear is white, that's how I remember....underexposure...too white. Like your underwear is white. Emma made that up.
3. "So I'm not the only one who makes those stupid things up?"
2. "What if your underwear is dark?
3. (Continues reading...."Rule out for osteochondrosis defecans..................)
1. See how we were looking at all of this stuff in here?

2. Now that's more opaque than it's supposed to be?
1. Yeah. The foramen is in here, and that's where, I think, that it gets more opaque. You were looking down here, right?
2. Yeah, I still don't know what that is. Up here you can't tell because the technique is bad, but in here, I think that it is more than it should be. It would be helpful if we had a normal cat.

Transcript 18:

1: "There is a large amount of free pleural fluid evidenced by obscured cardiac and diaphragmatic borders. ( The silhouette sign,....I remember that one.) ...and retraction of the lung lobes from the breast wall by soft tissue" ..........I just remember that being a thing.
2. Okay, so this is pleural effusion, right?
1. Yeah. There is water density surrounding the air.
2. And outlined by soft tissue density....Fluid is more in the left than In the right. It is more grey on the left than on the right. The darker one would be more air.
1. Oh, wait a minute, what did you say about left and right?
2. The fluid is more in the left than in the right.
1. Okay, I think that you can see this, this area looks thicker.
3. The "thing" always means left side.
2. I also said, "The lung borders are rounded suggesting cariosity and a viscous nature of the fluid. Due to the fluid, the cardiac shadow cannot be evaluated. Liver appears to be normal. No fluid in the abdomen. Diagnosis: Pleural effusion of unknown etiology, severe in left hemithorax, differential includes all types of pleural fluids, such as (________) blood etc. Rounding of the left lung borders is suggestive of an inflammatory fluid such as pus or (____). Chronic pleural effusion also causes similar abnormalities.
1. So because it is rounded, rather than ( ) you think ( ). Okay, a viscous fluid.

Transcript 19:

1. These are immediate post-op.
B. See the endocardial lead is still in, we didn’t pull that out.
2. Why is that?
B. Well, that was the cardiologist’s recommendation. I think, because....
1. They don’t unscrew, I don’t think very well
B. It’s pretty well locked in there, in the endocardial tissue and also there is an outside chance that maybe, if this epicardial lead ever presented a problem, they might still be able to use that lead, sometime later. So they are kind of leaving it in as a backup.
1. They can switch out the generator.
B. So, what’s what here? Do you have any idea?
3. I have no idea.
B. Are you close?
3. Sutures,...staples.
B Okay. She has correctly identified the skin staples.
1. Now for two hundred points!
B. How about metallic objects number two, for two hundred?
2. This is the actual controller for the pacemaker.
B. That is the generator.
2. Generator.
B. ...Generator, or the battery. That’s what generates the electrical impulses.
2. How long does it take for those to run out?
1. It depends. Right now, we are getting new ones. And the new ones, last about ten years.
But we used to get old ones,....
B. We used to get them removed from cadavers. From humans.
1. And then it was like anywhere from five to seven.
2. Do you take the gold out of their teeth?
1. Oh look! He’s got a watch on still! ( Everyone laughs!)
3. That’s a unipolar lead, right? ...the transvenous?
B. Yes it is.....unipolar means that the only way that this will set up a circuit is for the generator to be contacting the body as well as the lead touching the heart. The lead has
to be touching the heart, but this generator is just hanging
out here in space, ...nothing is happening.
Okay? So the body completes the circuit, which is really
kind of neat. As soon as you lay the generator on the
tissue, then it begins to work.

1. Does anyone know where that generator is right now?
2. I know that it is between muscle areas.
1. A little bit deeper. You can also let it float. So it can be
contacted by a (minim?) Or all kinds of other things. But
with having it in the muscle pocket we know exactly
where it is and if they need to program it or anything like
that, they can put the outside programmer right up
against the generator and know where they are.

B. This lead is a little different from what we used to use.
This is a....this looks almost like a fish-hook. It is hard to
see, but there's a little tiny barb on the end of that, like
you would have on a fish-hook, you know? The one's
that we used to use were a little cork screw wire, so that
you'd put it on and you would actually screw it into the
muscle. These are a little more difficult. We don't like
them as much because it is hard to tell when you've
gotten it all the way in there. It is just a tiny little thing,
and in addition to having the barb, .....or the hook in there
....you've got to place sutures from this little cup, (it is like
a little flat cup with a wire right here) you've got to
actually suture that to the epicardium, which is a little bit
challenging. Then you are pretty sure of it being in place
permanently. Now are you sure that this is the post op?
The long term post op?

1. No that's the immediate post-op.
B. Oh, this is the immediate post-op, alright let's look at the
new one.

2. So did they leave the other generator in as well?
1. Yeah.
4. Why didn't they take it out?
1. Well, they left the whole thing in place, so that if we
needed to switch off the generator at the cardia (bell?) That
they might be able to swap out the generator.....

B. This is a bionic dog.
1. Yeah, ...and that would take care of the problem with
worrying about capping the lead, and then the problem
with worrying about leaving the lead.

2. The head looks bigger to me.
B. Let's look at the other lateral.
2. It's magnified.
B. I don't know why the hook looks a little different. It looks like it is in a different plane for some reason. Like it's tilted this way a little bit. But that seems hard to believe,....
1. Well, the dog is a little....
B. Yeah, maybe it's him Maybe he's a little crooked.
1. Either that or they are (opposite?) Lateral positioning. They kind of look like opposite laterals, but....... 
B. Actually also, our loop looks different too, so it's probably just taken from a different angle.
2. Is this just free, or did you attach it to something?
B. We attached it to the diaphragm. You want to leave plenty of slack in the wire here so that it doesn't tug on..... if this moves this way, it wont tug on the wire, I mean on the lead.

Transcript 20:

so .i mean. if you have this many lung problems eets noot gooood. if thats fluid. or if thats pleural effusion. or if that atelectasis its something wrong with the lungs which means its something wrong (with the heart)
SM1: why does it have to be a problem with the heart? cause they ( ) us that these animals have cardiac disorders?

Transcript 21:

SF2: i mean..i didnt hear anything else. people seemed to have .like no idea what this was
SM1: noone suggested that any of these were ruptured diaphragm?
SF2: i heard one person say it. but .i dont believe it. because when you can see the diaphragm here. there. and then you dont . th theres somethingwrong up here with this lung and theres no if there were a ruptured diaphragm on this side. this should. this lung should ( ). and then gravity ( ) i mean it could be, its not like im totally adverse to the idea, but i dont right now...

SF2: I'll ask. I'll ask around and stuff.

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Transcript 22:
FS1: nope. cause that, i asked dr. blank not about this case but she said that really needs to come out here she says people wanna overinterpret right heart disease. because it. this side is much flatter than that side na naturally. so um. so i im not saying that youre wrong im just saying that
FS2: //no i mean
FS1: // my my my guess was a lot more right heart
(lots of overtalk)
FS3: so then what are we saying for the heart other than the pulmonary artery?

Transcript 23:
FS1: Ive a really bad habit when i look at xrays if theres something on there that im not sure about i pretend like its not there
FS2,3,4: (laughter)
FS1: cause i had .like now that i look at it for the second time i didnt even see it so ( ) i just blocked it out of my mind
FS2: i think it could just be summation cause that. apparently. i mean i dont get this but like uh the arterys just torturous and i remember the one in class it was like. snakin all over and i didnt think it got that big and whatever and i

Transcript 24:
1. Five and a half year old female Siberian Husky. "The animal was presented in November for( ) ovarian hysterectomy. She whelped approximately five months ago. The animal was re-presented in July of the next year, the animal was presented in acute collapse ( ) chronic coughing which developed following the ovarian hysterectomy." Okay, this is supposed to be normal. In November the animal was normal. In July, the animal was dehydrated and severely depressed.
2. This x-ray was taken when the animal was normal.
1. Yeah. This is November just when she had her spayed.
3. Why did they take an x-ray when she was spayed?
1. I don't know. Maybe to provide us with a normal abdomen.
2. Maybe because it was OSU.......Okay, so she is severely dehydrated and what?
1. Well, this one I guess is normal.
2. Yeah, that’s when the animal was normal, but is the x-ray necessarily normal?
1. No. Just read the November film, first. I guess you should look for abnormalities in this one.
3. What’s that black line above the trachea? A little bit of air in the esophagus, maybe.
2. Heart looks okay, is the liver enlarged?
3. No, not really.
2. How far does the liver come up? How far is it supposed to come up?
1. Up under the diaphragm.
2. So if it had hepatomegaly it wouldn’t move forward.
1. It would push the stomach, it would be more ventral.
2. The pulmonary ( ) is sticking out a little bit.
1. Look here. Right ( ) veins are ventral, that’s the bronchus and look at this artery.
2. Ooooooh. Okay. Looks like another artery. That is the one that is the pulmonary aorta, right.
1. Pulmonary artery....two, and the left auricle is like two ( )
2. Look right here, see how this hits more the sternum? So you have to suspect right ventricle hypertrophy? And then, all the patchy infiltrates in the caudal lung lobes?
1. And also, look at the ( cowboy? )
3. What was that called? ( the bow-legged cowboy?)
2. Oh really? See, I never knew she was talking about. I only saw the one.
3. You’re supposed to see a horseshoe. I’ve seen better horseshoes that these. I saw one in the clinic where I worked was like a classic horseshoe.
2. Really? See? I don’t see that there. So what’s causing the infiltrates, just that the worms are giving off some enzymes or whatever, that’s causing....... or pieces of worms.
2. Yeah, but it’s causing like an inflammation type thing?
1. I think so. Yeah. Well couldn’t it be too that, the right heart is clogged, so aren’t you getting some extra stuff stuck in the lungs too?
2. I think so, and like pieces of dead worms and stuff like that too? Where’s the bow-legged cowboy?
1. ( )
2. Oh. Okay. What is the bowlegged cowboy?
1. Big pulmonary arteries or veins.
3. I’ve seen better horseshoes. We actually had a coughing dog once, the dog was coughing up blood. It was an eight year old dog, that had
supposedly been on heartworm prevention. And so we were suspecting cancer. We took an x-ray, and it had a beautiful horseshoe. It was like amazing. That’s what made us run the heartworm test. We took a lateral.

2. They reversed these, Oh, is it because the apex is shifted over here?
3. I don’t know if......it’s shifted a little bit. That’s the right heart?
2. This side is the right heart, I would expect this heart to be bigger.
1. Except I think that you’re right, the apex might be shifted a little bit, but see how rounded that is?
2. All through here.
3. Yeah. I don’t know how huge it is, but it does look like it might be a little big.

2. Okay, so put the other one up and see if we see anything.
1. Okay, the arteries don’t look that big.
2. But maybe if we actually measure them.
3. The one, I was thinking, looked a little prominent with this one here.
1. The only thing that say is, “Slight increase in interstitial pulmonary opacity.”
2. ( )Caudal lung lobe.
1. Okay! It says on the radiographic diagnosis on this is essentially unremarkable. Case disposition: The animal died two days after admission in July.
2. GEE!
1. An initial heartworm evaluation at the time of the ovarian hysterectomy with the appropriate treatment at that time would probably have prevented the heart disease.
2. Nothing from November to July.
3. Yeah, but if you looked at this, heartworm wouldn’t even be considered.
1. Remember the arteries on the other one?
3. Yeah.
1. It may be a little bit bigger.
3. This one looks okay, and that one looks okay. The only one that stuck out a little bit was maybe this one........
2. This is November........This is November! Why would you heart test? Excuse me! You wouldn’t even think to.
3. Remember that this is back in ’74, and they didn’t know that much then. But if we have ....if we bring a dog in, that has not been heartworm tested, we would probably test them.

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1. Yeah, you have to do that now, right? Test before you put them under anesthesia?

3. I think that it is basically,......I don’t know whether they consider it a breach of standards, but they might.

1. Apparently, this looks like the owner’s fault. The animal was presented in acute collapse with ( )Chronic cough that developed following surgery, so maybe the owner should have brought it in earlier.

2. Is there like a reaction to the anesthetic agent? Can there be? Is that why you have to be sure that you test?

3. I think that any anesthesia puts a strain on the heart and kidneys and liver.

2. I just wonder if there was any kind of reaction?

3. There might be, I really don’t know. But if there is any kind of compromise in the lungs ( ) in pulmonary disease. I don’t know.

Transcript 25:
S1: there’s not much abdominal detail...
S2: cept’ what you do see is all shifted...
S3: left...( ) ive seen that a few times now and its not abnormal.

Transcript 26:
B: What comes in between soft tissue and fluid density and air density?
   (3.5)
S: soft tissue mass density?
B: (.5) wel this..theres
S2: Fat!
S: fat.
B: Wonderful! I like the way you just picked that right out of the air..ok, so you have fat thats//
S2: / / s a group inneraction thing
B: / / s right

Transcript 27:
B: Now, they call this metastatic disease. What does that mean to you?
S-1: That it’s a primary.
B: A primary what?
S-1: A primary neoplasm.
B: Ah! Thank you. I like it. I like it when people fall into my tiger trap.

S-1: Metastatic disease!

B: Metastatic disease does not define ( ) it could be metastatic as well as neoplastic, which means that something has spread throughout the body. So the reason why I say I liked it...it’s part of your education, because we teach you too much to go to very small areas and we’re actually doing you a dis-service because you’re not allowed to think that way... You come up and you think of the grouping and say, “Let’s just say that this is metastatic disease, that includes neoplasia in the section.” You have a better chance of coming down to what the problem is. But if I qualify it and I come down and say “That’s metastatic disease neoplasia,” I’m going to go over to the book and look up neoplasia ( ) may be sitting right next to it but you might not even be thinking about that. And I personally don’t care if you can tell me everytime what etiologic agent is on that film because that, more times than not, may be the beeper. I want to know about the regular horse we have out there. Your beeper is very difficult to hide anyway. So, metastatic disease is not a condition of neoplasia, it is the condition of a body section and or neoplasia ( )

So let’s talk about the two kinds of metastatic disease we’re dealing with. We’re dealing with infectious metastatic disease and neoplastic metastatic disease. Okay? One thing, before we go up here to the lungs, I hope you can appreciate the fact that we can get that information from the lateral view too, if there’s something going on and you want to be sure that you read the entire film.......

......being mean and nasty and cruel and putting you through a pop-quiz ( ) make sure you

Transcript 28:

S1: Collapsed lung?
T: Yes, collapsed.
S1: where?
T: Well, you ( ) yeah and normally you should extend up to here ok?

and at the level of the first rib ok so they are really retracted and so partially collapsed
S!:/uhhhh
hh
I dont follow im sorry

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T: / ok NORMally tha cranial lung lobes go up to
   the first inter
costal space
S1: yeah yeah yeah
T: /ok so now the edge is right there so you know
   that they are
   retracted
S1: /oh wow
T: /ok so
S2: /now theyre pushed like that
T: /yeahpush pushed like
S1: oh oh oh it
T: /so therese
less
   extension than normally
S2: /so this . this is .
T: /these are all lung lobes
S2: oh wow
T: the different segments of the lung lobes
S2: huh... ... huh yeah...collapsed...now wheres the middle right on here
T: /partially collapsed
T: yeah we dont see it very well, its probably this one the faint one you
can
   see its a little bit more lucent there...thats probably it so therese not much
air in
   it so that why we dont see it
S2: why would you not say that you would suspect fluid more so here
   on the card you say
   you suspect it more here versus the other lobes but i would think this is
   completely
   covered
T: /yeah
S2: /or completely filled
T: /because its down, yeah definit
S2: /so if its just
   fluid laying on top its not in
T: /on the top
S2: /ok
T: yeah
S2: ok (2.0) got it (2.0) thank you

Transcript 29:
1. I think that you’ve got that upside down.
Okay. History! This is a year and a half old male (sanabrush?) Chronic left rear leg lameness. Lameness has been present for two or three months and has been becoming increasingly severe. Physical exam: There is a mild joint effusion in the left stifle. The animal is positive on touch but did not show any improvement in lameness following the posterior digital blocks. What is your tentative diagnosis? Why do you need two radiographs?

1. “A mild joint effusion”....
2. You know, ....isn’t this awfully irregular in there?
3. Isn’t that a weird shaped patella? I don’t know what horse patellas look like.
1. I don’t think that they look like that.
3. It doesn’t look.....like I don’t see abnormal.....
1. This, .....why is this like this?
3. That looks like a growth plate.
1. Uh-Uh. I got carpus, fetlock and hick but no stifle.
3. Are you sure that we didn’t get the ones with the.....the artifacts ones? Is this like shadow.....the bone edge is right here, right? What’s that? Is that just the soft tissue? Or is that the bone edge too?
1. I think that it is the other....trochlear ridge....it’s so far out. It is so white.
3. I think that it is because you don’t have the two trochlear ridges on top of each other.
1. This would be your tibular tuberosity growth bone. But I don’t know what is happening in here. That looks odd to me.
3. Why....you’ve got all of this out here.....up in here.....and then you’ve got a radiolucency. But most of the muscle mass is behind the stifle.
1. Is there a tip of bone in it somewhere? What’s that thing?
3. Oooooh. A good one! There is something going on there!
1. Good one! Lucy! Let’s read the answers!!!
3. (Reads...........Radiographic findings: Lateral views presented here...etc..................)

Transcript 30:
2. Four cases for pregnancy evaluation.
1. Oh, look at that.
2. “Two cats and two dogs have been radiographed for evaluation of pregnancy.”
1. Oh, get this! “Determine if pregnancy is normal, the approximate stage of pregnancy, and whether the fetus is normal.
2. Oh come on, wait......wait! Where is the imprint?
1. Yeah, there’s a head......that’s a monster. There were supposed to be two dogs and two cats.
2. Looks like this one has got to be pretty close.
1. Okay so we are going to go with one......last trimester with that one, one puppy.
2. This is B, this is the same dog. Put it back up there. Yeah.
3. Here’s an “A”. This is a beastly dog to begin with.
1. Here’s one over here, and here’s a head over here.
2. I think that there are two.
2. Last trimester? Okay. Two in last trimester.
3. Two cats? What is going on here? This doesn’t look normal.
1. They are all in a little ball. They shouldn’t be. They should be in the uterine together.
2. They are all balled up......that could be his back.
3. Second trimester........
1. Two kittens.
2. Case A........"Lateral view shows two very well calcified fetal skeletons ( )
3. Okay, so we got two. But we didn’t say that they were calcified.
1. I’m thinking mummified!
2. Okay. Two cats. “When determining the number of fetuses present, you count the number of skulls or the number of spines. Normal pregnancy.”
3. So they’re normal.
1. What case?
2. B. “Lateral view demonstrates a single calcified fetal skeleton ( in the abdomen......)
   It is a mummified fetus.
1. YAAAAA! WHOOPPEE!
2. “Also we have a luxation at L-7, S-1. Cat is paralyzed at this time.
3. Geeez! I guess. Oh Man!
1. Oh my God! Look at his ass!
3. I was looking for babies.
2. Really mummified!...."lateral view of canine abdomen shows a single large fetus surrounded by gases in the uterus.”
1. Wait a minute. ....that’s a bad thing?
2. “It is a dead, emphysematous fetus.”
3. Where is the gas?
1. That’s what I wondered.
2. Oh, wait a minute,......maybe right here......along here.
3. Do we have a normal dog? There is no air in here, no air in this uterus at all.

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2. Okay, we’ve got one fetus. “The lateral and VD views of this shows single well calcified fetus. Note the distortion of the bones of the calvarium with it appearing somewhat dome-shaped on both views.”
1. It looks more like a person.
2. Yeah. On the VD views overlapping of the bones of the skull can be seen.
3. On the VD?
2. Yeah.
3. They appear thicker. Oh shit! I don’t know. That looks....... 
2. You can’t see it for the hip anyway.
1. One fetus with a dome-shaped hadst what does that mean?
2. Oh, hang on. A Dead fetus with collapse of the skull bones. This is one of the first signs of fetal death. Notice there is no gas surrounding the fetus and death occurred prior to ( ). Other signs to look for in fetal death are calcification of the musculoskeletal system which is less than expected and abnormal field position. Ultrasound can be used to verified if the fetuses are alive. Radiographic determination of fetal death is not definitive.”
3. I imagine not.
1. Not that we really saw anything. We got one right. One out of four.
2. How many films did we grab.
1. Twenty-five.

Transcript 31:
1. Okay................Let’s pray for a bone. Whooo-hooo!
3. Ten year old male schnauzer. “The dog was presented for a difficulty in urination. It appeared that she had chronic hematuria.
2. ( )Hematuria in a schnauzer?
3. Sorry,....Your’re right. “On physical, we’ve got gross hematuria with multiple red blood cells, white blood cells and bacteria in the ( ) BUN at 75.
2. Oh yeah! Look at that. That’s his penis.
1. No! Right there is the os penis! Look at these little round things.
2. Where’s the urethra?
2. Somebody put some “peas” up there. He’s got peas in his ( ).
3. We hope you’re enjoying this. Are you ready for me to read? There are some in the bladder too. “They did a urethroscopy and cystostomy and the animal made an uneventful recovery.
2. They say that passing one stone is like having a kid.
Transcript 32:

1. You didn’t give it the granuloma.
B. Right! Whenever people get on your case, just say, “Look “ (well, you don’t say it but) remember that you didn’t give them the original disease......Now what about this (Celloidin ) cream? You got somebody with that at all?
3. I know that it is used for burned victims.
2. It’s water-based.
B. Right. It is a very non-irritating. The big advantage of it is, it’s a sulfa type antibiotic, but it’s big, big advantage is that it has the ability to penetrate injured or even necrotic tissue. It’s very well absorbed by the tissue. And that has to do with it being a water-based product. You know a lot of these,.....she says she likes Furazone, and again I wouldn’t be a bit surprised if she tosses the Celloidin and uses the Furazone. Furazone is a petroleum based product that is more irritating to the tissue and doesn’t penetrate as well. So I like the Celloidin, it’s really a better preparation.
1. Nine bucks for a small tube , twenty bucks for a big tube. I don’t know what size the tubes are.
B. The biggest thing on topical preparations on wounds is , general, the value that they have on the wound is marginal at best, so the thing to do is to pick something that has at least no detrimental affect. You know a lot of times in large animals they spread on Topizone and some of those other......
1. Petermyacin.
B. Petermyacin. Hey, what is happening with that dog? Has his penis gone down, is it looking better? That case that they had.
1. Oh I don’t know. Did they put Petermyacin on it?
B. Petermyacin? Yeah.

Transcript 33:

S :  You takin notes?
M: mmhmm...tryin to figure out how you guys do this
S:  I’m tryin to figure out how us guys do this...they all look the same to me
M. (laughter......)
S:  you know, the large animal ones are even worse...its not like those things move a whole lot, either....I don’t understand why they can’t get em....(said toward grp of 3 women looking at small animal radiographs)
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