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ORAL HISTORY PROGRAM

INTERVIEWER: Charles Stuart Kennedy

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Q: Dr. Earle, I wonder if you could tell me why you were attracted to the Armed Forces Institute of Pathology (AFIP) and when did you come here?

DR. EARLE: I came in 1962. After I finished my residency training at the Montreal Neurological Institute and I taught one year at UCLA, I was given a professorship at my alma mater, University of Texas Medical Branch in Galveston, for ten years, and three years as dean of the medical school. I had known a lot about AFIP. I'd always respected it and I had always felt that it was, as many news writers have called it, the supreme court of pathology in this country. When I first got contacted about a job here, I was contacted by Dr. Webb Haymaker, who had held the job as chief of neuropathology from about 1942, I think, until I came in 1962, so I had known Webb. And Webb called me in the late fifties and wanted to know if I would be an associate of his. But at the time, I was a full professor with tenure in Galveston and dean of the medical school, and I just didn't want to come up and be his associate, although I admired him greatly. We had both had our training with Wilder Penfield in Montreal, we had a great deal in common, and I respected him greatly. But then later, when he decided to go full time with NASA, the National Aeronautics and Space Administration, I was approached by the director of AFIP, who was Colonel Frank Townsend. And I had known Townsend; Townsend had been on the faculty in Galveston at one time. And Townsend said they needed a neuropathologist, somebody that was at least moderately well known in the field. And so I came up and was interviewed.

I think one of the interesting things that made me really want to come here was the enormous opportunities for research and the enormous opportunities for education.

Let me be specific. When I first came here to be interviewed for the job, I thought I would put the AFIP to a test. In Montreal and in California and in Texas, I had seen only seven examples of a rare tumor called hemangioblastoma of the cerebellum. So I said, "Aha, I'll see how many these fellows have."

And the man in the Registry said to me, "Well, Dr., would you like them from the Civil War, or just from World War I?"

I said, "My goodness, well what have you got?" And I said, "Well, pull as many as you can conveniently pull and let me see the slides on this fairly rare tumor."

He pulled a hundred and six cases! And here, in three major universities, I had managed to see only seven, including the Montreal Neurological Institute, a very famous place. So I said, "This is the place for me."

The opportunities were certainly here. And from the time I came to the AFIP I gained nothing but admiration--at the people who worked here, at the availability of material, and just the great opportunities and the doors that it opened. I could have stayed a professor at Galveston

for years, but I would never have had the national and international contacts and the opportunities to work with the military that I got here.

Q: You came and remained as chief of the neuropathology branch. For the layman, what does that mean? What were your responsibilities?

DR. EARLE: Well, we had three major responsibilities, which is really the whole theme of the AFIP: consultation, education, and research.

In consultation we were the central pathology referral laboratory for all of the armed services, including some of the facilities from Great Britain and Canada. And in consultation we did receive a lot of controversial material from civilian sources as well. I thought it was really some great wisdom that the military did allow some of these civilian consultations to take place.

And, too, we were also called upon as consultants in various nationally televised things, to be specific. For example, in consultation there was so much controversy about the autopsy of John Kennedy that when Robert Kennedy was killed in California, we were contacted.

Q: This is his brother, Robert Kennedy, who was running for president at that time.

DR. EARLE: Yes, Senator Robert Kennedy. That's correct. The medical examiner of Los Angeles, wanting to avoid all the criticism he had heard of the JFK autopsy, contacted the director of the AFIP and asked for three of us to come out and assist as consultants. And we did, we were flown out and we consulted on that autopsy. And I think it's fair to say there has been no major controversy about that autopsy. We did it in great detail. We photographed before and after everything we did. We did meticulous examination and recorded it. So this is an example of what I mean by how we were called upon as consultants in various things.

The other one that caused a lot of press coverage was the case of Charles Joseph Whitman, an ex-Marine who got on the tower of the University of Texas and proceeded to fire randomly and, I think, killed over thirty people. So we were called upon in that. I use this as another example of how the AFIP had such prestige in those days that we were called upon as professional expert consultants.

Q: This is what you mean by controversial cases that came from the civilian side.

DR. EARLE: Correct. And, of course, just the ordinary biopsy specimens that came through day after day. We would receive as many as twenty and thirty controversial biopsies in a single day. Sometimes it was a controversy between this pathologist and that pathologist, and it was a very rare type of disease or a rare tumor, and we would give an opinion on it.

Q: Well, tell me, as a layman, could you explain something to me? One pathologist says it's this, another pathologist says it's that, it comes to you. How, at the time you were doing this, did you treat these? Was it just you, or did you sit down and work with others? Could you give me an idea of how you approached one of these?

DR. EARLE: Yes, well, many of these brain tumors are so rare that a person may encounter only one in a whole career. And at the AFIP if we had one, we had all of the resources here to call upon. We could call upon fifteen or twenty previous cases; we could pull these from the file, we could make comparisons. And we would respond also by writing papers, scientific papers concerning this particular type of controversy or this particular type of case.

Q: Well, let's say one comes in, would you sit there and do it yourself, or would you and a staff sort of go together? Was it a collegial approach when you'd do this?

DR. EARLE: Yes, well, we had so many cases to deal with day after day that I was very fortunate in having some excellent colleagues. Many of these I trained in neuropathology; some came to me already with some training. They all had at least basic pathology training, and I was able then to train them. Ordinarily, when a case would come in, I would detail it to one of the trainees, one of the residents. Most of them had come from major universities and were indoctrinated into the Army or the Navy under the Berry Plan. I don't know if you remember the Berry Plan?

Q: I've heard of it, would you explain what it is.

DR. EARLE: It was a plan in which physicians could serve their military service of two years of obligated service and they could be assigned wherever the Army or the Navy chose to assign them. And I was very fortunate that General Blumberg and some of the other directors here would go over the list every year and try to assign to me some of the most outstanding ones that had had some training in pathology of the nervous system. And I would assign a case to one of these men, they would do the preliminary study, and then we would, sometimes seven or eight of us at one time, go over the case together. So that every opinion we rendered was almost always a joint opinion, a combined opinion.

Q: And as each one of these went through, then you would further the registry of this thing.

DR. EARLE: That's correct. I don't remember the exact number of cases in the files when I came here, but I believe it was less than a million. And during the time I was here, it exceeded, I think, 1.6 million cases.

Q: You started in 1962 and essentially left in 1979.

DR. EARLE: That's correct.

Q: Just to go back to procedure, so somebody will, looking at this later on could understand how the system worked. If you made a decision, was there any way that sometimes something would come back and somebody would say, "Actually, I don't think that's correct."? There must be times when it was a difficult diagnosis and something else developed later on. How did this fit into the system?

DR. EARLE: Yes, well, although we were consultants and often considered the last resort, I had no problem at all in contacting other consultants. In other words, the people like Lucien Rubinstein, who wrote one of the AFIP fascicles, I would frequently, if I had some unusual tumor that I thought he might be interested in or of which I was uncertain, I would send it to him for an opinion, or to some other prominent neuropathologist in the country. Sometimes we would get as many as three or four opinions that way.

Q: Again, going back to this particular aspect, I would imagine, particularly in brain tumors, time would be much more urgent than for many other conditions. Did you have a feeling of pressure of time in working on things?

DR. EARLE: Yes, in many of the cases that's so. But probably not as much as you might expect, because many times the first definitive surgery had already been done by the time we got the specimen, and it was a matter then of follow-up treatment.

Q: Oh, I understand.

DR. EARLE: And so they wanted to know the malignancy of the tumor and how it usually behaved. And since we had all of this material in our files here and we did a number of studies on unusual tumors, we could say the usual behavior of this tumor is such and such.

We tried to avoid medical legal controversies. And I must say that another advantage of the AFIP is that we were more or less insulated from having to appear in court on every controversial case that came up. We only would have to give a deposition if it involved the federal government.

Q: How did you find the administration of the AFIP when you came in 1962? Because this is always a difficult thing. Here you are, you've come in as a chief of a branch, but you are under a military jurisdiction. You'd been the head of a department in Texas and all of a sudden you're under military rule. How did you react to this? How'd you find this?

DR. EARLE: I was actually warned not to come, for that reason. When I had gotten the invitation from Webb Haymaker, and later from Frank Townsend, I contacted Dr. Wilder Penfield, head of the Montreal Neurological Institute, and asked him what he thought about this. I said, "In my opinion, this is the number-one job for a neuropathologist in the world, not just in the States."

And he said, "Well, Ken, I really agree with you on that, but I don't know whether you can really get along with all of those military guys."

I think maybe he overlooked the fact that I had four years in the Navy. I understood the military and I liked the discipline. He was quite incorrect. Rather than the military interfering with me, although I was a civilian under the Department of the Army, I found they were the most helpful people I'd ever been around. They never interfered with anything I wanted to do. And they were always as though what can we do for you? It was almost as though they were

frequently consulting me as to what can we do next, how can we help you?

Q: Well, did you find it a different atmosphere than, say, a university teaching hospital?

DR. EARLE: Only administratively. I felt like I was still at a university here the whole time I was here, except for the administration. The administration went much more smoothly here. Much more smoothly. In other words, I didn't have to go out and plead for a budget every year. I didn't have to go out and make a line-item listing of everything I needed. We would request it, and the director always tried to get it for us. It was marvelous.

Q: What about the doctors who came? In the first place, including using yourself as an example, what did you think, or what do you think, makes a good pathologist? What quirk makes somebody go into pathology rather than something else?

DR. EARLE: Well, I suppose you could say that he likes the science of medicine. It's far more tilted toward the science of medicine than the practice of medicine. I think pathologists have gotten a bad name often. They say, "Oh, well, you guys don't like patients and you don't like people, so you go crawl off in your lab." Nothing could be further from the truth. Because essentially a pathologist functions as a consultant to other pathologists. In fact, it was a rule here that the material we received did not come from just any ordinary practitioner, it had to come from the pathologist involved with the case. That, of course, kept us out of being the middle man; we consulted with the people directly involved.

Q: Did you find a difference in the doctors you were getting? You talked about the Berry Plan. And in the mid-seventies or so, the draft ceased and the situation changed. Did you feel the results of this?

DR. EARLE: Very little. In 1962, I had started a course in neuropathology which was actually designed as preparation for taking the examinations of the American Boards in pathology, neurology, or neurosurgery. And this thing caught on like wildfire. And it turned out, as our prestige began to grow, that many people in training programs of major universities sent their students here, just as they have today. Just today, over in Bethesda, there are over a hundred and seventy registrants for this course which we started in 1962. The fact that it gained such prestige in this area, I no longer had to recruit; people were knocking on our doors wanting to come here for training.

Q: How long was the course?

DR. EARLE: It was a Monday through Friday.

Q: I remember reading a critique of our program here, saying that for military pathologists it was six weeks, and for civilians it was one week.

DR. EARLE: We had different programs. I mean, the course was just a one-week course given once a year. And that attracted, say, a hundred seventy this year. In some years we have over two hundred. But what you're talking about are those that came to spend time in the laboratory with direct instruction. In my day, the chief of neurology at Walter Reed, and the chief of neurosurgery, required their residents to spend six months or a year here. That was part of their requirement for neurology and neurosurgery training in the Walter Reed program. And I did a weekly brain conference with those fellows and then involved them in all of our day-to-day work.

Q: Did you see any change in sort of the administration and support as time went on, either for the good, bad, or just a different way of doing it? You know, from '62, you're in the beginning of the Vietnam War. By '79, it's a peacetime military that's sort of recovering from the Vietnam War.

DR. EARLE: Yes, I think that what you're alluding to is that we always did have a feeling that we had to justify our existence. There always seemed to be some threat that the AFIP was superfluous and maybe it should be cut out of the budget, or should be reduced, or should be moved somewhere else, and maybe it shouldn't be involved with so many civilian consultations. We had all of these things going on all the time. I think we always did feel somewhat under a threat of being disbanded. Because it's such an unusual institute. I don't think there's another one in the world like it, particularly not in the military or in the government.

Q: Well, your role really isn't as military as one might think, is it? Because you were being used by civilians, too, weren't you?

DR. EARLE: That's right. And this was a constant source of criticism by the people who wanted it to be strictly military. The people that I knew best came in World War II and remained as civilians. They all had military experience, but for quite a few years, during the time I was here, many of the major departments were headed by a civilian, although many of the people in the department were military. And the military actually was short-staffed; they just didn't have enough people to send here during part of those years. And there was always the threat of, well, let's disband all of these training programs; on the other hand, let's limit it to military trainees only.

Q: Were you able to, either privately or in a more official way, play the congressional card by getting a congressman whose constituents, and the entire American public, were obviously being well served by this institute?

DR. EARLE: I never did it directly, and it always amused me that we didn't have to. I think the AFIP gained such prestige that our colleagues out in the field were willing to go to bat for us. Nothing could illustrate that more, I think, than the threat of disbanding the Registry, which wound up getting a law passed, through Senator Kennedy's office. You know about that one?

Q: No, would you explain what were sort of the dynamics behind this.

DR. EARLE: Many of the major national professional organizations, like the ophthalmologists, the pathologists, the gyn and ob pathologists, they all wanted a central repository for cases, particularly unusual cases which, as I say, you may encounter only once in a lifetime. But they needed a central place where you could study this material in some depth and give an educated opinion on how some of these lesions behaved.

And so the AFIP started the Registry of Ophthalmology, I forget the year, and then other registries became established. And this was all done just as part of the Armed Forces Institute of Pathology; these were divisions of it, but they were sponsored by civilian societies, like the International Academy of Pathology, the orthopedic groups. And these were not just pathologists now, you see, all of these national societies wanted a registry of cases. And this was always done and budgeted through the AFIP's budget and just managed as part of the institute.

But some questions arose as to really should you be doing all this in collaboration with these civilian societies? Is this truly a military mission? And you could have raised some questions about that, but it had been going on and been so successful that nearly every major society that I know of wrote to their congressmen when this threat came to disband the registries. I think it all occurred because a surgeon general at the time really felt that this was not part of the military mission, that it ought to be abolished.

And, as I say, I never played the congressional card, but I know some of my friends who did. Art Silverstein, for one, who I think is a microbiologist now up at Johns Hopkins. Art, luckily, was a legislative fellow to Senator Kennedy at the time this threat came.

Q: This was around 1976-ish or something?

DR. EARLE: Yes. And he managed, through the...I don't know what you call them, the liaison men in Kennedy's office, to construct a law making it legal for the American Registry of Pathology to exist in the AFIP. And even go further. There was always a question about could the AFIP, could the Registry take money for its services, or should they charge for their services? And, if you took the money... In the early days, any monies that came had to go into the general Treasury. It didn't even come back to the AFIP, it was just back in the Treasury. Well, this law solved an awful lot of problems by making it legal to have it. And I understand now that it's going even further, into the selling of fascicles, the books that were printed here.

Those fascicles, too...you can't believe, unless you've traveled around the world, what a great impact those publications of the AFIP had not on just pathology but on medicine in general around the world. I've been in many countries where every hospital I went into they took pains to show me a whole set of these fascicles.

Q: How about the American Medical Association, AMA, which has always had an awful lot of political clout, no matter what administration. Did you find that this was helpful?

DR. EARLE: I don't recall whether they, as a unit, ever made a motion on it. Do you know?

Q: I don't know, no.

DR. EARLE: I know that individuals did, individuals of power in the AMA did come to our defense. And I'd heard it said, by one of the executives of the AMA, that he had never seen such a response to any controversy or issue as that threatening the AFIP; that he felt that more people had come to its defense than he could have imagined.

Q: Well, what about the use of the AFIP as a sort of reference point, a supreme court for pathological specimens, did you find that sometimes this was being overused?

DR. EARLE: Very much so. And this was one of the problems we constantly had to fight with. Not so much in neuropathology, but in some of the other branches there were some pathologists who overused the service, as though they sent almost every biopsy to get a diagnosis, for which they charged. And this really, really was bad and it had to be stopped.

Q: How did you approach that?

DR. EARLE: Well, two ways really. See, I didn't have to have this problem so much, but I do know that others... The main way was to give preference always to the military. Always. And so if we got anything from the military, the VA, that got first. And, in what I would call the slowdown approach, the people who overused it just simply didn't get an answer right away.

Q: Did you keep a...it's the wrong term, but if not a blacklist, a slowlist or something?

DR. EARLE: Yes, some of the directors did have a slowlist. That was our only real defense at the time.

There was also great controversy about whether we should charge. The pop phrase "user's fee" became quite widely used in those days. Some of us felt that if we charged a user's fee, it might actually inhibit the material coming in that was very valuable to us. On the other hand, it would probably stop some of this overuse of the service. And I understand now we have a user's fee here.

Q: Did you feel, as time went on, that things referred to you were being sent to you defensively? Because, you know, more and more, medical malpractice has turned into a major industry. It started really, I guess, around the seventies or so.

DR. EARLE: It happened very frequently. We would even be told, over the telephone or in a letter, that this case is coming up for litigation and we would really like to have your opinion. And some pathologists would delay giving a final opinion if they really thought it was going to cause a major controversy. I could give you some examples.

Q: Yes, please.

DR. EARLE: One was the brain of a pilot of a major airline, who had crashed his plane in Boston. And it turned out that he had had surgery for Parkinson's Disease. He'd had electrodes

placed in his brain. And the question was: Should he have been flying at all? Should there be regulations inhibiting someone who has had surgery for Parkinson's, or even Parkinson's Disease? And so this type of consultation, we examined the brain and we rendered an opinion on where the lesion was and what we thought the effects would be. It led to quite a hearing at the Federal Aviation Administration on what should be done. If you want the end of the story...

Q: Sure, let's hear it.

DR. EARLE: I think the end of the story was: Essentially you cannot ban a competent flyer because he might have had surgery for this or that, but he had to prove that he could perform the job. And they had never really put this particular person through the... In fact, he was still in an assessment phase when he crashed that plane.

Q: Oh, gosh. Well, skipping around a bit, how did you view the medical museum? This is what the public sees and all, and how did you view its value and how it was run?

DR. EARLE: Well, when it was downtown at 7th and Independence Avenue, when I first knew it and visited down there, I thought it was marvelous. Most everyone who visited thought it was part of the Smithsonian.

Q: I did, too.

DR. EARLE: And I know a number of people, who are now grown, who'll tell me, "Oh, yes, I remember going to that medical museum and seeing for the first time a giant, or giant bones, or...

Q: Or Daniel Sickles's leg.

DR. EARLE: Or Sickles's leg, that was one of my favorites, especially when it was General Sickles's leg. But I think from the day it moved out here it suffered. We made great effort to try to bring it back, and we did get busloads of students to come out from time to time, but it never had quite the same impact that it did before.

Q: Well, did you have a feeling that the museum played a role in recruiting a new generation of doctors? Were you getting from doctors saying, "you know, I never really thought much about medicine until I went there, and this sort of spurred me on?" Did you feel this had been an impetus to everybody?

DR. EARLE: It certainly was when it was downtown. But, after that, I think there were relatively fewer people, and I didn't get the feeling that there was that much impact anymore. There was some, but I think it lessened considerably.

Q: Again, coming back to the time that you were there, '62 to '79, at the AFIP, what was the spirit of the different branch chiefs? Here you were, one of them. Did you get together fairly

often to discuss administrative matters, or did you each sort of go your own way? Or was there a change while you were there?

DR. EARLE: There was some. Most of us stuck to our own branch and our own specialty, but we felt perfectly free to walk across the hall or down the hall and to get individual consultations any time of the day. It was quite free and open. I don't know of any branch chief who closed his doors. We were interchanged very easily. As far as administration, as I say, I personally felt that administration was a great load off my shoulders. Having been in administration before I came here, it was such a relief. I think occasionally two or three branch chiefs would team up and say, "Oh, well, you know, we don't like this, we've got to go to the director and try to make a change," and they would grumble a bit. But ordinarily they would just take their complaint to the director, and they would have a meeting on it, and it'd get settled. At least in my day it was that way.

Q: Did some of the directors have particular personalities that sort of stick in your mind?

DR. EARLE: Yes, I think they all did. Most of the directors had served as deputy directors before they became director, and they had a great feeling for it. I think the outstanding one probably was Joe Blumberg. Of course, Frank Townsend was quite good, too. And Captain Bruce Smith. They were all very dedicated directors. There were a couple in between. Two of them, I think, only stayed a year, and they really felt that they didn't fit in, and they left. We weren't too pleased with that. The ones that we really liked the most were those that served as a deputy director for four years. Blumberg, I think, served eight years before he became director.

Q: He became a general, in fact, while he was here. What was his style of operating, would you say?

DR. EARLE: Oh, I'd say *audace, toujours l'audace*. He was aggressive. And he knew General Heaton, who was the surgeon general for three presidents, wasn't it? He was a very active person; he never sat still on any problem. And he was always trying to improve the situation and get what we wanted or what we needed. He was a very aggressive person. Some people didn't like his aggressiveness, I must say, but I thought it was marvelous.

Q: I remember seeing a report by Colonel Morrissey. When he left he complained that the AFIP was unfocused. He felt it should be consultation almost completely and felt that each branch was sort of moving in its own direction and it just wasn't holding together. How did you see that?

DR. EARLE: Yes, Morrissey was a very competent fellow, but I must say I don't think he ever really had a feel for the AFIP. It was always more a matter of what are you doing for my hospital out in the field, or what are you doing for us? And I don't think he really could see the scope of this operation, especially on its national and international basis. Morrissey was just the opposite of General Blumberg. He never tried, really, to expand anything, he was wanting to justify it. I think he spent most of his days trying to justify in his mind what was going on.

Q: Talking about justification, you mentioned the three major pillars of this institution: consultation, education, and research. When you talk about research, there's research and research. How did you see the research for this institution?

DR. EARLE: Well, it fell into different levels. I think the most important research we did was research that we were asked to do. I think the one that affected me the most, that took almost two years of my major work, was when we were called into a secret meeting and a general from the Defense Department, I forget his name, came out and said, "There is a new tool available now; it's called a laser, L-A-S-E-R, light amplification by stimulated emission of radiation. And we're doing secret research on it with the possibility that it may be a military weapon."

Q: It initially started out as a death ray, didn't it?

DR. EARLE: Yes, it had been called a death ray. And he said, "We know it's a form of light. We know that it has certain wavelengths. We're aware of all this, but what we don't know is what are the medical effects of it. We have people working with these machines that are claiming headaches, they're claiming their wife divorced them because their personality had changed. We need some definitive data, what are the medical aspects of lasers?"

Well, I mean, we all knew this was a light, a beam of light, everybody knows about light, you know, and it was a hot beam, it was coherent, and it could be focused, but no one really had any hard data on it.

So three of us--Zimmermann in the ophthalmology branch, Helwig in the dermatology branch, and I in neuropathology--we essentially dropped everything else. We gathered up animals, and we (the director) hired a physicist, and we managed to get a ruby laser from the National Bureau of Standards. The Army somehow arranged this, I don't know how they did it. This was a ruby that had been synthesized at the National Bureau of Standards. It was a red ruby and it was cylindrical, it was about a half inch in diameter and about two and a half inches long. And it was arranged in an array of floodlamps that could be fired instantaneously. You had to first charge up a bunch of batteries, and then this instantaneous light would be focused onto this ruby. And then out of the end of the ruby would come a red beam, which was not always too visible, but you could blow smoke and you could see the red beam. We then focused this beam.

For my part, we wanted to determine what effect would this have if it impinged on the head, on the brain.

Zimmermann, what effect would it have if it impinged on the eye. Because a lot of the people working with it, they felt they should wear special glasses. It was known that this beam was so hot and so focused it could burn a hole in your retina if you looked at it. And some workers were claiming, gee, I've got a watch here, what if that thing bounces off my watch and into my eye? And we had no data.

And Helwig, of course, what would happen if you get this on your skin. Is it going to burn a hole right through you, or what?

Well, we did our experiments first with mice. And we discovered the beam was so intense that it would actually penetrate through the scalp in the skull of a mouse, which is a very

paper-thin thing, and could damage his brain. But what about a human? What about something with more of skull? Would it go into his brain? Would it hurt him?

So we gathered up a bunch of dogs. And we wanted to use the most powerful laser we could find. And the Department of Defense arranged for us to have access to a superlaser at Huntsville, Alabama, I forget the name of the place. The electrical supply came from Tulahoma. And they had an enormous laser there. It was super secret at the time. It consisted of neodymium in glass that had been manufactured by one of the major glass companies. And these were rods almost a yard long. And these rods were arranged in a circular array with huge lamps around them. And they had an entire trailer of batteries; they would charge up these batteries and discharge all of them at once. This huge flash of light would impinge on these numerous rods (we worked with one rod here), and these numerous rods would be focused in one point. This was really a powerful laser.

So we took some dogs down there. We had a little trouble getting somebody to fly us with a bunch of dogs, but we finally got a reserve outfit to fly us down to Huntsville. And we exposed these dogs.

And essentially we discovered that the laser would not penetrate through a thick skull; it'd go through a thin one, not a thick one. And it would burn the skin, which Helwig had already shown. And, if you didn't protect your eyes, you could certainly get something there. But, of course, from these experiments, we couldn't say whether somebody became nervous from working around them or had psychiatric problems. But at least, based on this research, the Army could say we now know that this will only penetrate a certain depth, it will not go any further, and that if you protect your skin and protect your eyes, you can quit worrying about it. And I think that helped them. That was what we set out to do. That took two years.

Q: You were there during the great days of space, and of course the military was involved with sending up people and monkeys, but mainly people during this time. It started in '62, when you arrived. What about the neuropathology side of space?

DR. EARLE: Well, Webb Haymaker's major interest was in cosmic rays and the possible effects of cosmic rays. Haymaker had been involved with the German scientists that were brought over after World War II, space scientists. And he was involved in sending various animals up into the stratosphere in gondolas and in balloons. These specimens that came back, the idea was they had some monitors in there to try to detect cosmic rays. Now cosmic rays are those things that don't come from the solar system, right, they come from outer space somewhere and they're particles. The size of them are submicroscopic, but it is thought that they are particles that can penetrate deeply. And Haymaker spent years trying to examine serial sections of the brains of these animals that were sent up into space, to try to find if there is a track, an actual track where a particle has gone through the brain. They were hoping, with the monitors, to be able to predict where the ray might have come from and how it penetrated. And at the time he died, he was still examining those specimens. He had thousands of serial sections of monkey brains for examples, and he had two other neuropathologists helping him. I never got directly involved, but I did see some of these preparations. He had that pretty well under control, so we didn't get into it directly. And none of the astronauts died, you know, we didn't get the brain of

any of them, so we never had to face that problem.

Q: We were doing quite a bit of undersea work in those times. It seems to have gone out of favor now, but there was quite a bit of living under water and all that. Were you getting involved?

DR. EARLE: Yes, we did examine the brains on some of these fatalities. Most of these showed hypoxic injuries. It was nothing you wouldn't expect. But there was a lot of work going on then, not only with humans but trying to train porpoises to carry explosives and to seek out targets. And in the Yakovlev Collection here, which I helped obtain, I helped convince the director to get it, some of that research was sponsored by the Navy, and there are porpoise brains in the Yakovlev Collection.

Q: This was the collection of Dr. Paul Yakovlev. Could you explain the background of what it was and how you got it and how it was used?

DR. EARLE: Paul Yakovlev was a Russian who had graduated from a military academy in Russia, but he didn't like the way things were going in the revolutionary years, and so he walked across the icy waters to Finland, and got out and got himself trained in neurology. He had already got his doctoral degree, and he got trained in neurology with famous people in Paris, including Babinski and Pierre Marie. Then he immigrated to the United States and had an appointment at Harvard and at the Fernald State School outside of Boston, which largely is inhabited by children that have Down's syndrome. They have some of them that come in in the morning and go home to their family in the evening. And, as these children died, there was a lot of research on this sort of thing.

Yakovlev had become very interested in doing serial sections of the brain in celloidin, a more solid medium for holding the brain intact than paraffin, which most people use. And it's extraordinarily tedious work. You have to take an entire brain, and it takes several weeks to dehydrate it and imbed it in celloidin. And then he invented a microtome, a knife that will slice, and he had it arranged on an inclined plane on which he would put his celloidin block with a brain, and this knife would come down and slice off a section. To make serial sections, it takes thousands of these. He ordinarily wouldn't save them all, you'd run out of space, he'd save every hundredth section. So he accumulated a collection of every hundredth section of the entire brain of humans with certain diseases, and of certain animals. And then the Navy sponsored him to do this work on the porpoises, which are in the collection, seeing if there was something special about the porpoise that they could use in their research.

This collection was stored for many years at the Fernald State School, and then it went to Harvard to their museum. And Harvard, during the years when NIH was sponsoring a lot of research, decided that they were going to disband the Harvard Museum where he had this collection, and it was in danger of actually being thrown away. Most people who knew what tedious work this was and that it was an outstanding collection that will probably never be repeated in this world, they got behind it and wanted to save it.

And Yakovlev, in desperation at one time, moved the entire collection into the basement

of his home. It wasn't well air conditioned, and he was terribly distressed, so he expressed his discomfort to John Van Buren, who was a neurosurgeon at the National Institutes of Health, and also to the director of the National Institutes of Health. Well, these people said we've got to do something. And John Van Buren came to me. I had known him, we had been fellows in Montreal together. And he said, "We've got to do something to save this famous Yakovlev Collection." And so I went to the director.

And, to make a long story short, after much negotiations, we got Harvard to relinquish any claim to it, although they had had all of the thousands of dollars of grants that had sponsored the work and there was some resistance among Harvard faculty to letting us have it. But our view was, "Look, you guys aren't taking care of it, it's going to deteriorate, you better put it into a place where we can take care of it and nurture it." Van Buren managed to get the National Institutes of Health to sponsor most of the cost of moving it and of preserving it. And I think for five or ten years they supported the Yakovlev Collection. And so that's how it got to be here. We transferred it, including Dr. Yakovlev, who came with the collection, and so did Mr. Haleem, who is still here.

Q: How was the Yakovlev Collection melded into your work?

DR. EARLE: Well, as I say, it is a historical collection and one that has all sorts of lesions in there that you would never find anywhere else. It's just a superb collection, and there are people from all around the world that want to come study it. One of the purposes it served, almost immediately, was, with the new radiological techniques coming up, such as CT scans and magnetic resonance, what are we seeing? They were seeing lesions, and some investigators came to this Yakovlev Collection to see if there were lesions in that collection that would correspond to what they were seeing radiographically. For instance, they've got serial sections of known diseases, is what I'm trying to tell you, in this collection. Then, if you have a clinical patient that has this disease, you can go to this collection and you can see what you're dealing with. Does this make sense?

Q: Oh, it makes excellent sense.

DR. EARLE: That collection will never be duplicated again, I'm sure, in the world. And I took the view when we were trying to get it that, look, this in time probably will save the government money, because I don't think anyone will ever apply for a grant to do serial sections on a lot of brains of this sort again. It's here. It's here and it can be referred to. And, now, with all of this emphasis on genetic research, or even in the military, identification by DNA profiling, this collection could be a godsend. This material could actually be used for some of the forthcoming genetics research.

Q: What about changes since you were there? Was sort of the DNA approach coming up while you were still there?

DR. EARLE: It was just beginning when I left, yes, and it's just snowballed since then, as you

know.

Q: Can you think of any sort of major medical changes, particularly in techniques that would apply to your branch, that came about while you were here, and how did the institute respond to them? I'm thinking of maybe CAT scans, and, you know, many other things of this kind.

DR. EARLE: I guess the one that made the greatest impact was the electron microscope. That actually came into use while I was here. I was here when we got the first electron microscope in this building. And I think the director was farsighted enough to realize this was a coming technique that we just really must get into. And he hired an expert from...I believe, from Switzerland, Gunter Bahr. And Gunter Bahr came over and set up the first electron microscope and trained several of my colleagues in the field. So that was one of the major, major changes that occurred during my time here.

Q: Well, it seems like your collection that you have here is one that has the ability to grow, because the human body's problems remain the same; it's the approach that changes, so that you can go at it with an electron microscope, you can go at it with DNA, and, god knows, a different type of chemical or something somewhere else.

DR. EARLE: Right. And immunopathology was the second thing, I would say, that had an enormous impact. We began to try to identify and separate different types of brain tumors, for example, with immunopathology. And just every week, almost, there would be some new antibody created in a lab that would identify a certain filament in a cell, or a certain segment of the DNA or the RNA molecule. And so this became...

I think immunopathology has not borne as much fruit as I would have expected. We would have thought by now that you could easily, by applying the electron microscope and immunopathology, separate any kind of cell in the world. But it hasn't really worked out that way. There are still so many mysteries to do with it.

But this DNA research now, I think, is on the horizon and beginning to show fruit. The fact that they are now sequencing a human cell's DNA is marvelous.

Q: With all these changes, like the electron microscope and research going on elsewhere, did you find, by the fact that you were acting here as the peer review or the court of review, you could parlay this into making sure that any new discoveries were being fed to you rather quickly?

DR. EARLE: Yes, I think we were aware of these things long before other people were, just because of the contacts we had nationwide. We would have people visit us who were on the threshold of new research projects who'd come and tell us about it. And we'd say, "Oh, well, we'd better get into that, and we'd better explore that." Yes, I think the prestige of the institute was so (I keep saying that) was so great that instead of us having to go out and look for some of these things, people were coming to us.

Q: Well, it was in their interest, too, wasn't it? If they were sending to you for review, they wanted you to be as up to date as possible.

DR. EARLE: That's right. And on perhaps a less elevated level, Mr. Luna, who recently died, I understand, who was director of the histology labs here for many years, published a stain manual for ordinary technicians to use. This stain manual is practically the bible for histology technicians around the world. And he did numerous changes in technique that became standardized, just absolutely standardized. It's just amazing to me how much that stain manual has meant just to the ordinary laboratory, military and civilian, throughout the whole world.

Q: You're talking about throughout the whole world, did you get any impression, as things came to you and all, about the state of medicine in other places? Obviously, the Soviet Union is one place, but also within Europe, Japan, and elsewhere. I mean, what were your impressions as you got specimens, requests from people and all that?

DR. EARLE: Well, let me put it a little bit into perspective. The fact that I was chief of neuropathology at the AFIP led me to become president of the American Association of Pathologists. I became very much involved in the International Academy of Pathology and the International Society of Neuropathology. And all of these international groups, particularly the Neuropathology and the International Academy of Pathology, they held meetings overseas in different countries. And not only could I visit that country and attend the meeting, but every time, the prestige of this place was so great, I'd be invited to visit their laboratories. I was actually taken into their hospitals, into the institutes. And I was so amazed, everywhere I went, to find Luna's stain manual and the AFIP fascicles. And it was almost as though they were honored to have this fellow from the AFIP come in and consult with them.

To turn the question around, though, I found that most of the European countries were still playing catch up. They had gotten terribly far behind.

Russia was terribly far behind in the neurosciences. They still seemed like they had never recovered from the old days of Pavlovian physiology. I had a couple of the Russians I talked to that actually seemed to be amazed that what I considered neuropathology was not putting electrodes into the brains of animals and checking their reflexes. It was just as though they were totally out of it. And most of the publications coming out of Russia really bore little resemblance to the modern neuropathology we had.

Now other places were trying very hard. The Germans, who came back after World War II, they came back with a bang. They had one collection of material similar to the Yakovlev, but most of it got destroyed in the bombing of World War II. But they were really coming back fast, and have come back fast since. The Siemens Company managed to construct electron microscopes for them. They got back into the modern pathology very quickly.

Hungary, I felt a little sorry for the Hungarians, because when I was there they were still under Russian domination. But they were so pro-Western you couldn't believe it. I got the feeling that if they could kick those Russkies out, they would have done it in a minute.

Q: Well, did you feel, in dealing with the Hungarians, for example, and maybe other places

behind what was then the Iron Curtain, that ideology was playing a part in inhibiting those who were working within the Soviet orbit?

DR. EARLE: Very much so. Very much so. The politics of it had essentially paralyzed them. They just were simply not able to function.

I had several very sad stories, for instance, from one of the neuropathologists from Yugoslavia. He was working under extraordinarily difficult conditions. They even had to be very cautious about what they published.

Q: I was in charge of consular work in Yugoslavia for five years during the sixties, and we had doctors who would come back to Yugoslavia to try the techniques they had learned, but they found that they couldn't get past, you might say, the political appointments of the heads of universities. And they pleaded to go back to the United States, because they felt they weren't able to make any contribution.

DR. EARLE: I thought the most pitiful of all of my foreign travels in this regard was the People's Republic of China. We went over there, I guess it was around 1979 or 1980, and their universities had been closed for ten years.

Q: The Cultural Revolution.

DR. EARLE: And, in touring six different medical schools, we met professors that had been trained at Johns Hopkins, that had been trained at Harvard, the old men. And two of them had been beaten. One of them had his eye put out, had been put in prison. And they were trying to bring Western medicine back to China.

Q: This was a result of the Cultural Revolution, which was basically an anti-intellectual movement.

DR. EARLE: I don't think most Americans were aware that the universities had been totally closed and there was just no Western medicine. And these elderly fellows, who knew some Western medicine, as they had known it, were trying their damndest to bring it back. And they were having a lot of trouble with the administration in China to do it. They all were very attentive. I mean, you'd lecture to a group of two hundred of them, and they would have a translator translating every word we said, and they were very attentive. But then, when you would visit their labs, it was just abysmal. And every time you would visit one of them and you would say, "Well, where is your autopsy room?"

"Oh, that's under repair. We can't show you that."

Out of some six medical schools, I saw only one microscope that was in workable condition, and it was pretty bad. It was just terrible.

Q: Moving back to the United States. Did you find, over the time you were here, that some of the university medical schools and all were, for one reason or prestige or something, sort of

competing or resenting the role of the AFIP?

DR. EARLE: Yes.

Q: Could you describe how this might have gone. Prestige is power, and power is a tremendous aphrodisiac.

DR. EARLE: There was some of that. But I think we overcame most of it. There was some of that. Perhaps I shouldn't put it in this context, but most of that type of opposition, it seemed to me, came from foreign medical graduates who had been educated overseas, and they were trying very hard to establish their own position. And they would sometimes do this at the expense of the AFIP by trying to say, look, we can do just as good as those fellows can.

But in neuropathology, at least, we had such an impact on, say, when you see my list of the people that we trained and sent out, that...

Q: We're going to append a list to this of the people who have been trained there.

DR. EARLE: I think history will show that these trainees that we had here, particularly during the after-World-War-II era, had an enormous impact on the teaching of neuropathology to neurologists, neurosurgeons, and pathologists.

Q: Speaking of wars, you were here during the Vietnam War, which caused tremendous divisions within American ranks. Did you find that, being a medical institution, although under the Armed Forces, dealing with doctors and all, that you were immune to the, you might say, the anti-military cast of so many of the educational institutions in the United States?

DR. EARLE: No, not entirely. I mean, there were actually demonstrations in Washington, D.C., in those years, and we were not totally immune from it. I think we were more protected than most, though. Being military, we were able to stay out of it. We pretty well stayed out of those controversies. The people who were assigned here in the military, I never felt they had any anti-military instincts at all. But there certainly was, around in the country.

Q: What about military medicine, from your perspective? Because you mentioned it had to have priority. What was your impression, and did it change either in competence, types of cases, or what have you? Because you were seeing these referrals all the time.

DR. EARLE: Well, I'll have to give you my own personal opinion about some of this, having been four and a half years in the Navy as a surgeon in the Navy. You become impressed that what most of the military people, they wanted a good doctor. They really are not terribly concerned whether you can fly airplanes or jump out of a tank or crawl on your belly, they're looking for a doctor who's going to make them well. In that respect, I don't think military medicine is absolutely unique.

But, on the other hand, in order to attract people to serve in the military and take much

less in terms of remuneration, you more or less have to train them from the start, like Dr. Yakovlev was trained in a military mission in Russia.

What I'm trying to say is that when the uniformed services university was proposed, to train military doctors, there was quite a bit of resistance to it. A lot of the civilian medical schools said, "Oh, my, we'll take those guys. You just give us the money you're going to spend on that new school over there and we'll be glad to take them. You don't need a military medical school."

But, on the other hand, I took the view that it would guarantee at least a cadre of militarily trained people who did have more of tropical medicine, for example, more of treating acute conditions: acute wounds, acute injuries, acute surgical problems. It would have some in which their education had more emphasis on the things that truly are of military interest than in the civilian medical school where you may have a lot less devoted to this sort of thing.

And so when Jay Sanford approached me to be the professor and chairman of the pathology department over there, I agreed. And that was my major reason for agreeing, I felt that there was a need for a military medical school, and that AFIP, of all places, had the talent to support it, and we had a lot of military people here, we certainly had a good feeling for what the military faced. And so I agreed to take the job over there, and I was their first professor, and I set up their Path. department for them.

Q: We're going to have to call this off very soon. In retrospect, what was your major disappointment when you were here? Everyone sets goals or wants to get things done. Anything not done that you wish had been done?

DR. EARLE: Well, I could name several. I suppose the main thing was that it sort of annoyed all of us that we had to constantly justify our existence. It seemed to me that the place was so well known that, certainly in medical circles, we didn't have to justify our existence. We were well known. But, somehow, every year or two when the budget would roll around, we were being harassed to justify our existence.

And, secondly, it was a great disappointment to me that we were not in the position that the old medical museum was, where they had the library. And I say to this day, if I have any influence at all I would like to see the AFIP have a whole new building next to the National Library of Medicine, which was historically the way it was downtown, or at least over in Bethesda. But it suffers, I think, from being so far away from this National Library. And yet you might turn the argument around and say, "Oh, well, we've got all these electronic gadgets now, we can access this material by fax machines and xerox."

Q: It doesn't work that way. Were you around when they moved, because just for some reason, I'm not familiar with this, but about four or five miles away is the Library of Medicine, which is under different auspices than here, and this all was rather arbitrary. Were you around when some of these decisions were made?

DR. EARLE: Well, I was just out of medical school. I think it was around 1947 or '48 when that decision was made, and, at the time, I was on active duty in the Navy. But I was aware of it,

and I had visited the old medical museum. In fact, that was the first place I had ever seen what was called a thermofax.

Q: Oh, yes. For the uninitiated, the thermofax is the equivalent, a very poor equivalent, to the Xerox today, and God knows what it will be the next twenty years from now.

DR. EARLE: That's right. The papers came out looking burned.

Q: It was, thermo fax. I mean, it was a burned piece of paper.

DR. EARLE: That was one of those things. I really felt that the AFIP would not have had to perhaps justify its existence nearly as much if it had been more or less independently located, say, over in Bethesda or by the National Library of Medicine.

Q: Well, going to the more positive side. Looking back on it, what gives you the greatest satisfaction?

DR. EARLE: Oh, I guess my greatest satisfaction has been in the educational realm, of having so many fine colleagues that have distinguished themselves in the field of neuropathology. And I've taken great satisfaction in knowing that the AFIP has managed to give me the opportunity to be president of two international societies and hold offices in others.

Q: And as a final subject, how do you see pathology as a career today for a young doctor? A young doctor comes to you and says, "Dr. Earle, what about pathology? Should I be one or not?" How do you reply?

DR. EARLE: Oh, I think it's still just as great a field as it ever was. I feel that it's not going to be nearly as remunerative as it used to be, with all of the regulations that are going on now. Pathology, I'm afraid, may revert to where it was back when I was a lab technician in college, and that is, the pathologist was a paid employee of the hospital, and that he was on a fixed income, and that he was more or less subservient to the hospital administration. I'm afraid it may recess a little.

But, on the other hand, pathology is just as vibrant now as it ever was. And there are so many new tools and so many new methods, no doctor can keep up with all of that. Somebody has got to be around to hold together the science that pathology really is. There are people who "dabble" in pathology in other specialties, but there's got to be somebody who can see the whole body from the brain down. And I think pathology might suffer a little bit of a recession in coming years, but I don't think it's a dead science at all.

Q: Well, Dr., I want to thank you very much. I really appreciate it.

DR. EARLE: Well, thank you.

KENNETH M. EARLE, M.D.

AFIP - 1962-82

I came to the AFIP in 1962--the 100th anniversary of the institution--a successor to the Army Medical Museum. I succeeded Webb Haymaker M.D. as Chief of Neuropathology Branch. Haymaker had held the job since 1942. He left to do research with NASA at Ames Research Labs in California. I left the University of Texas Medical Branch in Galveston, Tx. when I was a Professor of Pathology and Dean of Medicine. Col. Frank Townsend, MC USAF, Dir. AFIP, recruited me to join AFIP.

CONSULTATIONS

Regular consultations by mail--increased rapidly--no charge. Assisted by military physicians assigned to the AFIP, mostly serving 2 years under the Berry Plan and others regular Army. Consulted frequently by WRGH, VAH (Wash.), Georgetown Univ. and George Wash., Univ. on a personal basis. I started a weekly Brain Conf. at WRGH for residents in neurology and neurosurgery and these residents spent 6 months to a year in training with me at the AFIP. Also called upon frequently to serve on committees at the NIH and for national & international organizations and the WHO. Lectures & slide seminars at various universities and prof. societies.

Special consultations sanctioned by AFIP and Dept. of Defense included:

Senator Robert Kennedy autopsy 1968 Los Angeles (DOD airplane to LA)

Charles Joseph Whitman autopsy 1966 Texas (R. Lee Clark MDAH, Wm. Russell MDAH)

(Not called for Pres. John Kennedy autopsy but placed on call).

EDUCATION

Weekly Brain Conferences at WRGH

Daily departmental conferences

Annual course "Review of Neuropathology" started in 1962.

Trainees who received most or all of their training at AFIP to be certified by American Board of Pathology in neuropathology. Their names and positions follow:

Col. Vernon Armbrustmacher MC USAF - Director AFIP.

Col. James M. Henry MC USA - Medical Liaison Officer, British Army, London.

Richard L. Davis M.D. - Professor of Neuropathology, University of California School of Medicine, San Francisco, California.

John M. Hardman M.D. - Professor and Chairman, Department of Pathology, University of Hawaii School of Medicine.

Peter Lampert M.D. (deceased)- Professor & Chairman, Department of Pathology, University of California - San Diego School of Medicine

L. Douglas Balentine M.D. (deceased)- Professor & Chairman, Department of Pathology, University of South Carolina School of Medicine.

Michael Hart M.D. - Professor & Chairman, Department of Pathology, School of Medicine, University of Iowa.

Reid Heffner M.D. - Professor, University of Buffalo Medical School.

William Schoene M.D. - Neuropathologist, Brigham & Women's Hospital, Boston, & Faculty, Harvard Medical School.

Umberto Digirolami M.D. - (Same as Schoene) - formerly Professor at University of Massachusetts, Worcester, Massachusetts.

Jan Leestma M.D. - Professor of Neuropathology, University of Chicago.

Carol Petito M.D. - Professor of Neuropathology, Cornell University Medical School, New York City, New York.

Nirmal Saini M.D. - Neuropathologist, Veterans' Administration Hospital, Washington, D.C.

Sydney Schochet M.D. - Professor of Neuropathology, University of West Virginia School of Medicine.

Cdr. Kathy Kagan-Hallet MC USN - Professor of Neuropathology, University of Texas at San Antonio.

Carl Boesel M.D. - Professor of Neuropathology, University of Ohio at Columbus Medical School.

Stirling Carpenter M.D. - Neuropathologist, Montreal Neurological Institute, Montreal, Canada, and Professor at McGill University.

Uros Roessman M.D. - Professor of Neuropathology, Western Reserve Medical School, Cleveland, Ohio.

Tom McGee M.D. - Neuropathologist, Mississippi.

Steve Bauserman M.D. - Professor of Neuropathology, Texas A&M Medical School & Scott & White Clinic, Temple, Texas.

Fred Klutzow M.D. - Retired Neuropathologist, formerly Director of Labs at several Veterans' Administration Hospital facilities.

William McCormick M.D. - Professor of Neuropathology, University of Tennessee (formerly Professor, University of Texas Medical Branch, Galveston, Texas.

Frank Iannotta M.D. - Neuropathologist, George Washington University, Washington, D.C.

Many other pathologists, neurologists, neurosurgeons received a few weeks of training at AFIP while they were on duty at NIH, USNH Bethesda, George Washington University, Georgetown, Johns Hopkins, and other facilities in the area. More than 2000 students attended the annual Neuropathology course sponsored by AFIP and American Reg Path from 1962-1982.

Our department assisted Lucien Rubinstein M.D. in preparing fascicle No. 6 of second series of AFIP fascicles.

UNIFORMED SERVICES UNIVERSITY OF THE HEALTH SCIENCES

In 1976, Jay Saunders M.D., Dean of USUHS, asked me to become the first Professor of Pathology at USUHS, to recruit a facility for the dept, arrange for equipment and furnishings for the new buildings at USNH Bethesda, and prepare to teach the first second-year class in 1977. The first class to begin in 1976 had been selected. 32 students were enrolled. During the academic year 1976-77 I taught neuroanatomy to the first class while organizing the Dept. of Pathology to teach pathology in the second academic year. In academic years 1977-78 & 79 I taught pathology to second-year students. The first year (1976) we taught in hastily constructed facilities in the museum area of AFIP & moved to Bethesda USNH for the second year.

To complete my civil service retirement requirements, I returned to AFIP in 1978 and became the first Executive Director of the American Registry of Pathology in 1980-82 when I

retired and moved to Lafayette, LA, my wife's hometown.

RESEARCH

LASER RESEARCH - In 1964 we responded to a request by Dept. of Defense to conduct research on the medical aspects of LASER radiation. We did experiments on dogs & mice using a RUBY LASER and neodymium LASER - Results published.

See bibliography for other research projects in which I was involved. Other publications & studies were made by other members of the dept.

AWARD, ETC.

See my C.V.

Acquisition of Yakovlev Collection & support of NIH and Col. Hansen & Col. Ray Cowan.