Dr. Michael Gottesman
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Interviewer: Sandeep Khot
The purpose of the interview is Dr. Gottesman's reflections on the research associate training program at the NIH when he arrived in 1971.

Khot: You were a research associate in 1971. When was the first time you heard about the Associate Training Program at the NIH in medical school?

Gottesman: Okay. So, if memory serves me, I think I applied during my third year of medical school, so it wasn't my fourth year. I'm pretty sure it was my third year, but maybe my memory back that far is a little.... And I think it was around then that I heard about the program. And you have to understand, in the context of those times, we were all potential medical graduates. We were pretty certain of having to serve in the Army. There was a physician draft in effect. When I graduated, every physician in the country was either drafted or did alternative service. So, in addition to the intellectual benefits of being in the program, there were reasons to start thinking about what we would do as physicians once we graduated from medical school and did our essential internship training.

Khot Okay. What was the perception of the other medical school professors or classmates towards the program?

Gottesman: Oh, I think it was very positive. I was at Harvard Medical School, and a large number of my colleagues were talking about the program, were interested in the program, were encouraged to apply to the program by our professors and our senior faculty. It was very positive.

Khot: Can you describe the application process and with whom did you interview with, if you remember it.

Gottesman: I don't remember precisely. I know there was a general application form for the NIH. And then, once we had been accepted to be... Well, I'm trying to think whether we were accepted first and then we were asked... I'm pretty sure, actually, we were accepted based on the physical evidence, such as it was, about our scholarship, our success in medical school, our letters of reference. And then we were allowed to come to the NIH. We were invited to the NIH for interviews and could choose among the various institutes, who basically were very interested in attracting the research associates because we had central funding through the Public Health Service Commissioned Corps. And any lab that could attract us would have essentially a pair of hands and a scientist who they didn't have to support out of their lab funds because there were central funds to support it. So we were very well treated when we came down.

I remember interviewing in a couple of institutes. I interviewed at what was then NIAMD, which is now NIDDK, and I'm pretty sure I interviewed in the Heart Institute and talked to three or four different senior scientists and made a decision, based on those

interviews, of where I wanted to be. But at that point, when we were interviewed here, we already had been accepted into the program.

Khot: Considering the high level of competition, how important was it to have some sort of connection, or was that important at all?

Gottesman: I had actually no connections at all. I had advice from my colleagues, who knew NIH and had experience with the NIH, and they advised me in terms of what the good labs would be in, but I had no specific contacts. As far as I know, the decisions about who was in the program were made in an objective way.

Khot: Okay.

Gottesman: I don't know, for example, what percentage of people who applied got in.

Khot: Can you describe the research training environment at the NIH when you came to the...

Gottesman: Oh, it was spectacular. *It was one of the most exciting times in biomedical research. NIH was the center of the biochemistry universe. I was interested in biochemistry. Molecular biology was just beginning*. People were beginning to use genetic and molecular tools to study problems in biology, and there were just a number of really outstanding laboratories and outstanding opportunities for training.

Certainly, I ended up working with Marty Gellart [sp.], who had already discovered a very important enzyme in DNA repair and replication called DNA ligase, and was beginning to study in other enzyme DNA gyrase, which he also discovered. And my project involved figuring out what the function was of this particular enzyme in normal biology of bacteria.

Khot: Other associates have commented on how the associates "taught" each other their field, immunology or... Can you describe any special collaboration in which you participated as a research associate?

Gottesman: I'm trying to think whether there were any other associates. I remember working very closely with other scientists and fellows at the NIH, but I think I was... My science was done in collaboration with other scientists who were interested in the same field that I was…preceptor and colleagues. There were other associates here at the time. I remember two particularly who were in Gary Feltzenfeld's lab on the same floor that I used to interact with; Howie Seider, who's a very well-known professor, now has a professorship in Israel; and Richard Axel, who's a chair professor at Columbia, a very well-known scientist. You may have heard of him. Both of them were on the floor, and we sort of interacted a little bit during the day. But scientifically, my interactions were mostly with other people working in my field.

Khot: Others have also remarked on the flexibility of some of the principal investigators in allowing associates to pursue their research interests in a way they wanted to. Can you elaborate on that?

Gottesman: That was absolutely true. I mean*, I needed training in bacterial genetics to do the project that I was interested in, and I mostly picked that up by interactions with other bacterial geneticists who were working on the project.*

A year after I arrived, Marty Geller, who was my senior advisor, went on sabbatical to Europe, and I became basically the senior person in the laboratory. So that involved guiding my own project. It also involved a responsibility that he had had, which is to teach a course in DNA replication with Phil Leder [sp.]. So, normally Marty taught, in the FAS, taught the course on replication, Phil taught the transcription translation. So I substituted for him and I became a professor in the graduate program, teaching a course in DNA replication, which was an incredibly useful experience for me. So not only was I suddenly an independent researcher, but I was also a teacher. Isn't that interesting. *But there was an enormous amount of independence, no question about it.*

Khot: Was this flexibility something that was pervasive throughout the program?

Gottesman: I think I had probably more than most because my supervisor wasn't there. But I think it was. *I think the understanding was that the people who were in the program were exceptional students and they would learn quickly and they would be given as much independence as they could to do what they wanted to do.*

Khot: Okay. Is this support still present in the program today?

Gottesman: Well, we don't have a research associate program any longer. When we bring in clinical fellows or research fellows who are M.D.s, the degree of independence depends to a great extent on the amount of prior training that they have.

I had done a lot of research. I had already published a couple of papers, and I had pretty good experience, and I felt comfortable making sort of day-to-day decisions about my science. The overall programmatic directions were set by the laboratory and supervisors.

So, nowadays I think it depends a lot on the background. We do occasionally see M.D.s who've had very little research experience, and they need much more training, much more mentoring, much more day-to-day support. The M.D.s who come in with the kind of background that I had are also given a fair amount of independence.

Khot: Do you recall if there was ever a specific research agenda for the associate training program of scientists?

Gottesman: Overall, you mean?

Khot: Yeah.

Gottesman: No. I think the goal of the program was to train people in the conduct of laboratory research. The clinical associate program was for clinical research, and the training was really no different from the training that other postdoctoral fellows got at the NIH.

I should say, however, before I came, there was a period of time in the ‘50s, and I think in the ‘60s, in which there was a more formal training program which involved tutorials, lectures, and so on. By the time I came, that part of it was gone and we were just sort of integrated into the normal training. You might find out, you might be interested in finding out more about that.

Khot: Yeah, when that was phased out.

Gottesman: Yeah, one that was phased out. Who would know? Somebody like Henry Metzger would probably know. Henry, I’m sure, would be available.

Khot: In your opinion, was there any link at all between the associate training program research and the war effort?

Gottesman: Well, in a sense, there were connections, but they weren’t direct. In other words, there was no effort made to connect the research we were doing with what was going on in Vietnam. We weren’t working on any kinds of biological weapons. Some people who were clinical associates might have been interested in aspects of the care of trauma patients that might have been relevant to the war, but there was no direct connection. Indirectly, the connection was that this was an alternative to military service, so people who would otherwise have been in the military were given an opportunity to do research, which was an incentive for people who were not particularly interested in military medicine. In addition to which, after we graduated from the program, because we had been commissioned in the Public Health Service, in the Commissioned Corps, we were actually eligible for Vietnam War benefits as veterans, so there were some veteran benefits which I think... For example, there were some, I’m trying to remember exactly what... There was a little bit of additional support if you were, an additional training program after you left the Corps, and I went back and continued my residency, and I think there was some payment that I got as a veteran, having been a veteran working at the NIH.

Khot: Along the same lines, just looking at the numbers of associates, it went up every year almost, even past 1970, all the way up to 1973, to the end of the war, to the end of the doctor draft, and it slowly started declining.

After ‘70, there was a de-escalation of the war. It seemed like the program kind of, between ‘70 and ‘73, kind of grew in popularity even though the war was kind of de-escalating.

Gottesman: Well, I*m trying to remember exactly what happened. *The year that I graduated and did my internship, every single physician in the country was drafted.* So

the war may have been winding down, but the need for physicians was not. And, in fact, the war was going pretty strong until ‘73, ‘74. I don’t have the exact date when we started to pull out, but... So I think probably there may be a lag because people committed a year or two in advance to being in the program, but I suspect that it tracks pretty closely with the war.

The program also, I think, by the end of the war, had already gotten a reputation as being a fabulous opportunity for people who wanted, physicians who wanted to do research, so I think there was a continuing influx even though the war was gone until the program was discontinued. And I’m not sure. When was it discontinued?

Khot: It’s hard to say for sure. It seems like it’s kind of evolved into something.

Gottesman: Right. We had... It has evolved into something different.

Khot: I’ve been studying more up till ‘73, and I haven’t really gotten to the point where I...

Gottesman: I suspect it was ongoing, certainly into the ‘80s, and maybe as far as ‘90. Certainly, when I got into this position, we didn’t have anything like a research associate position.

Khot: Okay. What about the associate training program most appealed to you?

Gottesman*: I think the opportunity to have independence but to learn a lot in a laboratory setting. I was always interested in laboratory research. It was just a dream come true. It was full-time research in a terrific lab.*

Khot: Can you elaborate on how the style of your laboratory chief and clinical director during your training at the ATP, Associate Training Program, influenced your style as a scientific instructor?

Gottesman: Marty Gellart [sp.] was my mentor when I first came in, and he had a sort of easygoing personality but a very incisive mind. And when we discussed issues, *it was clear that there was no room for sloppiness in thinking or in design of experiments. I learned that controls were critical. I learned that it was important to choose problems carefully, to choose model systems in which you could answer questions, and I think virtually everything I know about science I learned in that setting.*

As I mentioned, I had done research before, so I had little bits and pieces. I knew my way around a laboratory. I knew basically how to design an experiment. I knew how to use machinery to take care of laboratory items and laboratory safety and integrity and design and so on. *But I hadn’t had an opportunity to conceive of a research program of my own, and Marty was very encouraging of developing independence in the people in his lab, and everyone who’s ever been in his lab has been very quickly independent, more a colleague than a trainee.*

Khot: How has the training to bridge clinical medicine, the bedside work, and the lab bench work that you received in the ATP influence the way you train scientists; bedside to bench?

Gottesman: The lab that I was in was a really very basic science laboratory. It worked in bacterial systems to study basic issues related to DNA replication and repair. But my preceptor realized that, as a physician, I had some special training that should be brought to bear on the research side, and he suggested very early on that I try to develop a genetic system in culture to human cells or animal cells that could allow us to answer questions that we were answering in bacteria in more relevant systems. So the translational component was actually initiated by my mentor, who felt that, because of my particular background, I could be doing work like that. And so I began to read and think about other systems, and when I eventually went on…I went back to Harvard, finished my residency, but also became an assistant professor in the Department of Anatomy there and started a project which was directly related to the reading and thinking that I'd done at the NIH in a more relevant system for human disease.

Khot: As a research associate, your laboratory, was it in the Clinical Center?

Gottesman: No. It was in Building 2, actually.

Khot: Okay. And you spent all your time doing research. You were not going to the Clinical Center to see patients?

Gottesman: Well, no. I didn't see patients here. I actually continued... I had... One morning a week, I served as a preceptor and as a physician at George Washington University, so this is a sort of an outside activity, non-compensated outside activity, to keep up my clinical skills. And I taught medical students and I took care of patients in the clinic setting, a general medical clinic setting. So that's how I kept up my clinical work. I didn't do anything really at the Clinical Center.

Khot: Do you think that most alumni from the program used the training they received at the time to train scientists in a novel way after they left the program?

Gottesman: I think most of the people have used the knowledge and training that they got here to either practice research or as the basis for their training of other people who would become researchers, so I think it was a very formative time for everybody who was here. And I think you'll find, if you tracked individually all the people who were here as research associates, a high percentage of them made really good use of their training.

Khot: How did the experience in the ATP modify your career decisions?

Gottesman: Oh, it convinced me that I wanted to do basically full-time research, and that my aspirations to be a so-called triple threat-- you know what the triple threat is, that teaching, practicing medicine, and research-- were, and every physician kind of thinks

about that as interesting research…that I would probably limit myself mostly to research and teaching and not, didn't feel the need to have a clinical practice.

Khot: Dr. Edward Rall has commented that the ATP has had a major influence on medical education because of the addition of a serious research component to the training of M.D.s who were going to end up in universities was pioneered here. Would you elaborate on that?

Gottesman: Well, Ed Rall was actually the scientific director of NIAMD when I was in the program, so I had a lot of interaction with him. He was a strong influence on the program. He later became deputy director for intramural research, but at the time he was scientific director in what was one of the two major research institutes. NIAMD, now NIDDK, and Heart, Lung and Blood were the two major research institutes. Cancer was beginning to develop a really strong research program but wasn't really there at that time.

I think the program has had enormous influence on all the biomedical research in a variety of ways. I mean, *one way was that it created a cadre of people who went out and became professors of medicine and brought with them an interest in research that could be translational or basic, either. I think it created a body of knowledge because we were pretty talented people who were capable of doing quite a lot, which influenced the direction of medical research in this country. So both through the people and through the knowledge that was created, this was a very important program.*

Khot: If you wanted to get experience, not as a research associate but in the clinical medicine where you're applying directly that bedside observation to laboratory benchwork, was this the only program that you could come to?

Gottesman: No, no. I mean, *I was up at Harvard, and it was clear that I could have gotten similar kinds of experiences staying at Harvard in research laboratories there. It was established. There was already quite a lot of support for the kind of research I was interested in. And I think probably without the war going on and the possibility of being drafted, I would have stayed in a university setting.*

I should point out that at that point, I was married. My wife was a scientist. She had a Ph.D. And we needed to find places where we both could do the research that we wanted to do. One other advantage of NIH was that she was able to find quite a good postdoctoral position here herself as well, so that made it doubly attractive to us. But there are universities in which we could have done the same thing.

Now, remember, I wasn't doing very much clinical, I wasn't doing any clinical research when I was here, so all I needed was a basic science laboratory.

Khot: How do you think the ATP has changed, if at all, the reputation of NIH?

Gottesman: I think it's been a very positive influence through the voices and activities of the people who were training in the program. We're talking about hundreds of people.

They're out now in departments of medicine, running things in this country. It would be nice to know precisely how many of them, but you run into them all the time. There are a lot of influential people who trained in the program and so continue to have a sort of reverence for the kinds of science that you need to do in order to improve medical research, and also a very positive feeling about the NIH, about the reputation of the NIH, and that has helped enormously in encouraging their students to come back here. And they, for example, frequently become members of review groups for the NIH and so on. *They're willing to do things for the NIH because of the experience that they had here.*

Khot: In your opinion, what has been the long-term effect of the ATP alumni on the academic world in scientific research? Can you give specific examples?

Gottesman: Yeah. Well, I mean, *the influence in terms of becoming the heads of various medical research programs that propagate the kind of science, the quality of science that's done at the NIH; they've had an enormous influence in terms of actual scientific discoveries,* Nobel prizes, for example. Mike Brown, Joe Goldstein, were here. Brown and Goldstein obviously won a Nobel prize for their work on cholesterol, which was to some extent initiated in concept while they were here. Harold Varmus was the clinical associate. He won a Nobel prize. Let's see, what's the other? Stan Prusiner [sp.], who got a prize for his work on prions, was a research associate. I mean, it goes on and on. People won Lask [sp.] awards, Nobel prizes. And it all reflects the kind of training they had when they were here. It was an extraordinary cohort of people, amazing. And as you start to catalog who these people are, you'll see that it was an amazing program.

Some would have gone on, probably, and been successful in any case, but I think most either wouldn't have had the opportunity or wouldn't have had the environment that fostered this kind of success.

Khot: Dr. Fauci described how the work he did with with the aberrant inflammatory response in Wegener's and the eventual cure came from the benchwork-to-bedside phenomenon. Can you describe any, I know you were a research associate, but any clinically-driven paradigm shifts that came as a result of the training that you received here?

Gottesman: Yeah. So, I mean, the path is very clear. I actually gave a talk recently to some students who wanted to know how I got where I was and how that happened, and I talked to them about the intellectual, obviously.

So I came here because I was interested in using genetic approaches to study problems in biology. I learned how to do that in a bacterial system with mDNA replication. My preceptor here said you can do the same kind of thing in a field, which was just beginning to get underway, which was called somatic cell genetics, by studying cultured somatic cells. As soon as I left here and had a lab of my own, I began to do that kind of research and got interested particularly in studying tumor angiogenesis because I was working with Bert Valle [sp.] up at Harvard and Peter Folkman [sp.] at that point, did that for a few years.

And then I came to the NIH and developed, continued to develop these genetic systems for studying cultured cells and got interested in why cells become resistant to anti-cancer drugs, and that led to our work on multi-drug resistance, which is clinically extremely relevant and has resulted in many clinical trials of different types.

One type of clinical trial that we've done is to develop mechanisms to reverse drug resistance. Knowing now what the mechanism, what things inhibit the pump system that causes drug resistance, we can develop systems for reversing drug resistance.

Also, there have been trials in gene therapy using drug-resistance genes to protect normal tissues against the toxicity of chemotherapy. So there have been, directly or indirectly, a lot of clinical results. It's still too early to know what overall impact that work is going to have on the field of cancer research and drug resistance in cancer, *but there's a clear pathway from my early studies here in bacterial systems to the somatic-cell genetic systems to the development of information about drug resistance in cancer cells that I owe to the experience that I had here.*

Khot: Did the collaboration with other alumni continue after you became a tenured intramural investigator?

Gottesman: Yeah. I mean, there are still quite a few people here who were research associates. My colleagues in this office, Richard Wyatt [sp.], was a clinical associate in NIAID when he was here, and we frequently reminisce about our experiences here. And, in fact, a lot of what we do is predicated on the training that we got when we were here as students.

I have many other colleagues at the NIH who are, who were researcher clinical associates that interact frequently. I wouldn't say there's a social club of such people because they're probably more integrated now into the fabric of NIH, but there's certainly a sort of understanding that we have about the role that this program played in our careers that people who didn't go into the program don't have.

Khot: Do you feel that the ATP created a sort of "invisible college" in which a network of scientists, alumni from the program, continued formal and informal relationships and exchanges?

Gottesman: I don't think that's been true in my case. I think mostly people have lost track of each other. And we haven't even had a reunion or anything else. But because I've been at NIH for the last 30 years, I run into people all the time and we talk about this, we tell others, we tell the students we have about our experience here. So it's not so much invisible as sort of virtual. I mean, there's a feeling that exists, but there's nothing really formal that goes on.

Khot: Can you discuss any unintended negative effects the program may have had in keeping minorities and women out of high-level research positions today, that these groups were not represented in the program?

Gottesman: Yeah. One of the things that I became aware of when I first got into this position was that the salaries at that point in the Corps were comparable or better than salaries in civil-service positions, so that *because this was a program that seemed to be mostly involved men because of the draft aspects of it, I think that women were not as involved in the program and were in a sort of unconscious way, didn't have the benefits of the program.*

But you should be aware-- you may not be aware-- that when I graduated from medical school, only about 10 percent of medical graduates were women, and almost none of those women were interested in research. They were interested in practicing medicine. Now it's 50 percent. But it was 10 percent then. So there already was a bias against women in the medical profession, for whatever reasons, that may have influenced, more than this program, whether or not women were involved in research activities. Women certainly were getting Ph.D.s. My wife at that point got a Ph.D. in molecular genetics. And those avenues were open for women. But they weren't in the Corps because they didn't have the draft issues, they didn't have, there weren't that many graduates of medical schools, and the ones that were weren't interested in research.

Khot: I've got a few questions about the legacy. Dr. Robert Gallo is quoted as saying, "My fear is that the intramural program does not function at that same level in terms of the interplay between the lab and the bedside, and probably no place in the country now does. I think the NIH leadership clearly has not assigned full value to this function historically, in part because of the practical necessity and cost and in part because of a lack of appreciation or respect for the process." Would you respond to that?

Gottesman: Sure. I mean, one of the earmarks of my administration as deputy director of intramural research has been *to try to recover that sense of the continuity between the basic science and the clinical research at the NIH*. And when Dr. Varmus became director, which is when I became deputy director for intramural research, we made a real conscious effort to encourage those kinds of bench-to-bedside and bedside-to-bench activities for which NIH had become very well known. Dr. Gallo left the NIH around that time, and so was not familiar really with what's happened in the last eight years. But clearly there's been an enormous increase in encouragement of people going into clinical research. The number of clinical protocols has increased, the number of clinical investigators has increased, the percentage of our funding which is clinical in nature has increased.

We have two major programs now that are relevant. One is the Howard Hughes Medical Institute program, which brings students here, mostly after their second year, to do exactly what medical graduates were doing in the research associate program; that is, working in our laboratories. We started another program, which is a clinical research program, clinical research training program, which brings people here after their third year of medical school to learn about clinical research, which is now a much more highly specialized field than it was before.

And so, in those programs and in the overall encouragement that we've had of people to get into clinical issues, I think we have recaptured a lot of that excitement of this kind of connection between clinical and basic science.

What I'm not sure we've done is attracted the same number of physicians to long-term research careers as we had in the past, partly because of the mandatory nature of the service.

One of the things I always say is our loan repayment program, which helps physicians work in laboratories because we pay back the enormous debt burden that people now have leaving medical school, which we didn't have before, *that the loan repayment program is the moral equivalent of the Vietnam War and the Korean War in terms of encouraging people to come here and giving them the wherewithal to come to the NIH.*

Khot: In fact, that was one of my other questions. In 1995, the NIH Director's Panel on Clinical Research found that there was low physician funding for clinical research that was due primarily to the fact that physicians just weren't applying in sufficient numbers for the NIH awards.

Gottesman: The success rate is the same, but the numbers of physicians who apply and who reapply as a percentage of the total is less than it used to be.

Khot: One of the suggestions that they had made-- and I'm aware that you'd initiated such a program to attract scientists from disadvantaged backgrounds to NIH-- was a loan repayment program for physicians, something that in a large scale would...

Gottesman: We have that program intramurally. It's been very successful. And we have a program now extramurally, which hopefully will be in next year, which is specifically targeted at people interested in clinical research careers, and particularly from disadvantaged background.

Khot: Was that something that required an act of Congress to do, or is that just something...

Gottesman: Yes.

Khot: Okay, it did.

Gottesman: Both our legislative programs. Initially, the program that we've now had for six or seven years…

Khot: The loan repayment part of that required Congress to...

Gottesman: I'll give this to you. I think it's…These are the various loan repayment programs that are intramural, when they were established, when they were implemented, and all the requirements for those programs and so on and so forth, and the distribution of

students. You can see that some of them really have quite a substantial underrepresented minority for this program, which is our clinical research program. It's a quite substantial minority.

Khot: Can I get a copy of that?

Gottesman: Yeah. I don't think that's a problem. It's just from the Office of Loan Repayment Office. It really does summarize. The contact would be Mark Horowitz [sp.], who's the director of the office, and he can give you additional... But, yeah, we felt that this has been a very useful recruitment tool for the intramural program, and now it will be available for extramural as well.

Khot: Can you discuss the possibility today in an atmosphere that's much more individualistic and less service oriented, for the government to mobilize medical talent for specific objectives, let*s say, dealing with AIDS crisis in Africa?

Gottesman: That's an interesting question. I think there are... My impression in terms of the earlier career people that I've had interaction with in the programs here and other programs and as I've said my daughter is a recent medical graduate who's just finished her medical internship, so I have a sense of the cohort that she belongs to…is that there are a lot of people who are interested in public service. If their normal daily living requirements, which include the loans that they have to pay back and a reasonable salary, could be supported, I think there are a lot of people out there who would be very interested in the public health issues. I think we continue to see people coming to the NIH for that reason, go into the CDC for that reason. *I think you can't mobilize all the talent that you could when people, when it became a mandatory part of their service, but I think that there are still a lot of people out there with the appropriate kinds of encouragement, mentoring, advertising and so on, who'd be delighted to have careers that are directed towards improving public health.*

One of the programs that we initiated is actually related to health disparities. It's called the NIH Academy for Health Disparities Research. And it's not a program for medical students; it's a program for people who are post-baccalaureate, have graduated from college, to come here to learn about what opportunities there are in research. At the moment, the majority…this is the second year of the program. In the first year, the majority of those students, but not by any means all of them, were interested in going to medical school, because they learned enough to know that they needed a medical education to do what they needed to do, research. And we've had, the program had only 10 physicians the first year, and we had about 80 applicants even without huge amounts of advertising. So there are a lot of people out there who are interested in these kinds of opportunities, and I think what NIH intramurally tends to do is pilot programs, and if they're successful, find ways to encourage the medical centers to carry them on.

I think the CRTP program, which is the clinical training program, is ready to be propagated. I think the NIH Academy seems to be successful so far. In one year, it seems to be. It could be in other programs, propagated to encourage this kind of public service.

Khot: In the past few years, there's been a movement in our society to honor those who served in the armed forces during World War II and Vietnam. On the other hand, while the legacy of the ATP alumni has been enormous in altering American medicine as we know it, the recognition is somewhat lacking, and there's still that somewhat negative connotation associated with the term 'yellow beret'. Are you aware of any resentment or sensitivity among your associates to this?

Gottesman: No. I think most of the people who've been through the program think of it as probably one of the most positive experiences in their lives, and most of them have benefited from it in terms of their careers, their successful careers. There's no greater reward than that. And the sense of satisfaction of making contributions biomedical research . So I don't think there's any sense of being left out.

Khot: In 1967, Representative Daniel Flood of the House Appropriations Subcommittee on Labor and Health and Education said, "A quiet revolution in the practice of medicine is taking place as a direct result of research." Can you comment on this and anything else you feel that we should know about the program?

Gottesman: *I think there is an enormous revolution going on, and I don't think it's very quiet. I think you can't pick up a newspaper or a magazine without a big headline about the genome revolution, the proteome [sp.] revolution, the revolution in diagnosis, all the ethical and moral and social issues that have come up as a result of the changes in the practice of medicine. This is going on now. It's in the public eye. It's not quiet.* It's in your face mostly, and it's a great thing for the public to be involved. I mean, some of the things that are happening will need lots of public input in terms of acceptance. Other things are changes in the practice of medicine that physicians themselves need to learn more about, the diagnostic tests and so on. Prevention is going to become the major tool once we can predict what diseases people will get, and prevention becomes critical, because you don't want to tell people bad news and not be able to do something about it.

Khot: Do you think the sense of excitement, opportunity, and determination that used to permeate the field is compromised by financial and career anxieties today?

Gottesman: It's my sense in talking to young people who are interested in going into medical practice or research that they are much more practically oriented than my generation was. They're thinking about what their salary will be, how they can pay their debts, how they're going to be able to have a reasonable social life while they're working. *There was a sense of more idealism that came out of my generation than I feel now.* On the other hand, people are very practical, they're very capable. There are enough people around who are interested in public service that I think we can carry on. So, there's a little bit of a sense. And some of it has to do with the striking sort of social revolution that was happening when I was graduating from medical school, as well as the war and various other things going on.

Khot: When you say a social revolution, do you mean Johnson's Great Society?

Gottesman: Yeah. I mean, *there were a lot of things happening. The civil rights era had ended in the United States. The sense that the government could provide important services for the public was increasing and the Johnson Great Society was on everyone's minds. The war itself polarized the population in an amazing way about what the role of the U.S. was in the world. There was a lot of discussion, a lot going on, more than I think... People were more politically oriented then than they are now.*

Khot: In recent years the concept of "translational research" is under a real, somewhat of a directional bias in which most basic discoveries are made in basic science labs and then applied in the clinic. Can you comment on that? And do you think it has to do with the fact that the technology required to do biomedical research has become so sophisticated and it's difficult for many clinical research-training programs to keep up with that sophistication?

Gottesman: Yeah. I mean, it is true, having in a sense lived through medical school again with my daughter, who just went through medical school. The amount of information that medical students are expected to know is incredible. When I graduated from medical school, our dean said to us, he had good news and bad news. Fifty percent of what they told us in medical school was right and 50 percent was wrong. And, in addition, they didn't know which was wrong and which was right, and it was our job to figure that out. To some extent we've done that, and *the degree of certainty with which we teach medical students is much higher, but the quantity of information is enormous. It's becoming harder and harder for any one person to sort of grasp all the information and use it in a way which is useful either in their clinical practice or in their research.*

On the other hand, we have new tools. We have bioinformatics tools, we have lots of publications tools where we review journals, and just using Pubmed to get research done makes life a lot easier. So whether or not those tools have totally kept up with the enormous surge of information, I'm not sure, but it's become highly technical, very difficult, and we've continued to need capable people to do biomedical research, no doubt about that.

Khot: Dr. Gottesman, I just want to thank you for taking the time to speak with us.

Are there any other associates that you can suggest that we should talk to? We've had a few at the NIH that we've...

Gottesman: Tell me who you've talked to. You talked to Tony, obviously.

Khot: I talked to Dr. Fauci yesterday over the phone. I spoke with Dr. William Kelly [sp.], who*s at the University of Pennsylvania, and this was my third interview. We*re also scheduled to speak on Monday with Dr. Schechter, Alan Schechter. And then there*s a couple*Dr. Kelly [sp.] had suggested we speak with Dr. Snyderman [sp.] and Dr. Weingarten [sp.] down in North Carolina, and then we*re also trying to reach Dr. Gallo and Dr.... Let me look at my list.

Gottesman: Well, the people you're speaking to are very senior people who have leadership positions now. I don't know whether it would be worthwhile talking to people who are more in the trenches, but it might be department heads and people like that.

Khot: Sure. Could you suggest...

Gottesman: And you don't want to talk to a lot of people who are still at the NIH.

Khot: Yeah.

Gottesman: Well, I mean, one person who actually was a colleague of mine for many years and I think can give you a very good perspective on research, and whose own research was influenced enormously by the research associate _____, is Ira Paston [sp.]. You might want to talk to Harold Varmus, clinical associate.

Khot: Yeah. I think we're trying to reach...

Gottesman: Rick Klausner [sp.], who*s the director of the Cancer Institute.

Khot: Okay.

Gottesman: All of whom would be terrific. I mean, there*s hardly anyone here who wasn*t a research associate _____ a lot of people.

Khot: Most of the directors of institutes.

Gottesman: Well, not the current directors, but... Let me look at the directory. I mean, virtually all, everybody _____.

SIDE B

Gottesman: Richard Hodess [sp.], who's the director of the Aging Institute, I'm sure was a research associate. Tony Fauci _____.

Khot: We also tried to contact Dr. Harry Kimball [sp.] and Dr. Sam Broder, Samuel Broder.

Gottesman: I mean, if you look at the directors of the… I'm just looking at Allergy and Infectious Diseases, and I don't know for sure about these people, but here are the labs. Cliff Lane [sp.] is a clinical director. I'm pretty sure he was a clinical associate. Steve Strauss [sp.], who's the director of the Laboratory of Clinical Investigation, was a research associate. John Gao [sp.], who*s the director of the Clinical Center, was. Bill Paul [sp.], Ron Germane [sp.], Sandy Morse [sp.], Joe _____, Al Martin. Bernie Moss, I'm pretty sure was. You know, this is like a high percentage _____ 80 percent of the people in NIAID. Steve Katz was in the _____ major _____. He's the director of ANS.

Rick Klausner [sp.] we mentioned. Ira Paston [sp.], Jake Mozell [sp.], Doug Lowey [sp.]. These are lab chiefs at NCI. Steve O'Brien [sp.]. _____. _____. Curt Harris [sp.].

Khot: These are all people you remember from...

Gottesman: Pretty much, yeah. They've been here a long time. _____, who's the director _____.

Khot: We are getting a sense that _____ esprit de corps among...

Gottesman: Yeah. There's a kind of a... Yeah, it's a sort of a sense of shared experience. Maybe the same way that people who get together after having been in a battle or a war, you know, to reminisce a little bit. It wasn't a negative experience. It was a positive one. Josh Silverberg [sp.] _____. No lack of people to interview.

Khot: Okay. Thank you again.

Gottesman: You're welcome. I'd be delighted to see something, if you have something written.

This project is collaboration with the DeWitt Stetten, Jr., Museum at the NIH, and the Tulane University School of Medicine.