Behind the Mask

October 21, 2022

Dr. Michael Gottesman

Barr: Good afternoon. Today is October 21, 2022. My name is Gabrielle Barr, and I'm the archivist with the Office of NIH History and Stetten Museum. Today I have the pleasure of speaking with Dr. Michael Gottesman. Dr. Gottesman is a senior investigator, the chief of the Laboratory of Cell Biology, the head of the Multi-Drug Resistance Section of the Center for Cancer Research, National Cancer Institute [NCI], and since 1993 until August of this year, he was the deputy director for Intramural Research and Director of the Office of Intramural Research [OIR], which is part of the Office of the Director. Thank you very much for being with me today and talking about your COVID-19 experiences and role in navigating the pandemic.

Gottesman: My pleasure Gabrielle.

Barr: My first question is how and when did you hear of SARS-CoV-2, and what were your initial thoughts and later fears about how it would affect NIH's Intramural Research Program?

Gottesman: As you may remember, it was January of 2020 when we all first heard about SARS-CoV-2 through newspaper reports basically. There were some cases in China and beginning to be cases throughout the world, and it became clear that probably the United States would be affected in the not-too-distant future. You may remember that the White House – President Trump at that point – started the Coronavirus Task Force at the end of January in 2020 and engaged the NIH through Dr. Anthony Fauci, who was obviously director of NIAID [National Institute of Allergy and Infectious Diseases] and our chief expert on pandemic viral diseases. We all were aware of it. It was a day-to-day phenomenon that we were worrying about and thinking about. NIHers were already beginning to work on antiviral drugs. Literally in a few weeks, the study on the efficacy of the anti-viral drug remdesivir was started in non-human primates out at Rocky Mountain Labs.

Barr: For Remdesivir.

Gottesman: Remdesivir, which turned out to be a very effective agent and is still one of the antiviral agents of choice for hospitalized patients. It's given intravenously and is pretty effective in suppressing the virus. We were involved, NIH was involved, from the very earliest days in dealing with the pandemic and trying to find ways to treat patients or prevent disease.

Barr: How are you a part of decisions about which labs would be sent home in March? That was a very big decision that got made.

Gottesman: In addition to the Coronavirus Task Force, which was begun by the White House, the NIH started its own coronavirus response team early in February. I was one of the senior members of that team. It consisted of a few intramural scientists, Steve Holland (who was the scientific director of NIAID), Jim Gilman (chief executive officer of the NIH Clinical Center), and the Occupational Medical Services at the Clinical Center because they were involved in lots of decision making and the safety of people on campus. There were a few extramural executive officers and people with administrative responsibility, and we were assembled and met daily at 7:30 every morning remotely to consider how the NIH would

respond in a uniform way at a very senior level. Those meetings were run by Francis Collins, who attended virtually every meeting except when he was called away for some other business that he had to attend to, and Larry Tabak, who was the NIH deputy director, was present. A co-chair was Alfred Johnson who is our deputy director for management, and I was a senior member of that committee and got to weigh in on all of the issues that came up and the decisions that were made. The number one decision – and you remember the context here was schools are being closed throughout, businesses were being closed, restaurants were closed--was how much of NIH needed to be shut down to assure the safety of our staff but also the continuation of our important research.

Barr: Hospitals stopped doing elective surgery, which was major.

Gottesman: It was basically a shutdown of a lot of activities. That affected our ability to work at the NIH as well. We didn't have any really good protective means of assuring the safety of people who were coming to work at the NIH, so we wanted to minimize the number of people who were working. We formulated a response plan, and I was one of the people involved in suggesting ideas for who could and could not come to work. Obviously, we wanted our security force, our maintenance staff, our animal caretakers – and I should point out that at that point a lot of universities were making decisions to close down their animal programs. We did not do that. We felt the animals were an important component of the work that we did here. That it was important for us to continue to maintain our colonies of animals, most of which are rodents – you know mice and rats and so on – but other animals as well so that we would be able to get back to work quickly and in fact could continue important work that require those animals. The animal caretakers needed to stay on, and I would say the people who came in under those circumstances were somewhat heroic because it was unclear at what risk they would be working.

Now in terms of the science, obviously anyone working directly on coronavirus-related research was encouraged to continue that work if they possibly could. We described things that were mission critical that might not be directly coronavirus-related but were really critical activities, and we expanded that to include activities in which people had invested a lot of time and resources. If you had an experiment that took a year to set up and not coming to work would mean you would lose your entire investment, we would be sensitive to that need and would allow people to come in under very defined restricted circumstances. There was a subcommittee of our response team which was chaired by Steve Holland, and Steve would receive the requests. We asked each scientific director to review the requests coming in from the scientists and to either say no or, if they thought it was feasible to, send them along for central review. Then Steve and the committee, which included me, would look at them. We would vote. We would weigh in. We would say, “Yes, this makes sense,” or, “No, there's no way that the risk benefit analysis is favorable to the person coming in.” And so, people began to come back to work in the labs and clinics. The restrictions on who could come to work was a strong incentive for people to work on coronavirus because that was the only way they could come into the laboratory, but that wasn't the only reason. Obviously, people were interested in participating in activities that would support public health.

Barr: Before we go further about the meetings – what was the setup? Did you all have an agenda and you talked about different issues, or did you have a short PowerPoints keeping you abreast of all the changes and all the data every single day?

Gottesman: Information would be sent out on a daily basis, and that would include the number of cases at the NIH that were asymptomatic and symptomatic. Remember, we had initial initially set up testing in the Clinical Center for both symptomatic and asymptomatic patients. We had data about the local

community. We had information about the rules that the department was propagating from the White House and the CDC recommendations, and we tried always to follow CDC recommendations.

Barr: Sometimes you all are stricter than the CDC.

Gottesman: Sometimes, particularly with respect to masking. At that point, I had engaged some of the NIH scientists who were epidemiologists and biostatisticians (and remember this is before vaccination) to figure out what the best way was to keep people safe who were coming to work, and it turned out to be a combination of masking – I'll say something about masks in a moment because we actually contributed to the dialogue about whether masks were useful or not – and testing. Testing – it turned out once a week was not perfect, but it was pretty good. And masking on a regular basis and the more individuals who were masked, that is if both parties were masked, the likelihood of transmission was small. You've probably seen this Swiss cheese example where you have multiple layers, each of which has holes in it, but the holes don't coincide and so at the end of this long array of Swiss cheese slices the likelihood of something getting through from one end to the other is small.

We did some analysis intramurally. We also did a survey. One of the thoughts that I had was the more we engaged our intramural community in decision making, the more they would feel a part of the process; and it would help morale; it would help compliance with whatever it is we decided to do. We asked people about those things, about masking and testing, and got results indicating that the majority of people were comfortable with those kinds of approaches. Particularly if it enabled them to come safely back to work. Through that period, we had very few, if any, transmissions at the NIH. Elodie Ghedin, who was a senior investigator in NIAID, had at that point started sequencing the SARS-CoV-2 virions, and so we could tell if we had two cases at the NIH whether they were related by infection because the sequence of the virus would be very similar. We had a couple of examples where people had clearly been together under less-than-ideal circumstances and had transmitted the virus, but the number of likely transmission at the NIH you could literally count on the fingers of one hand.

Barr: Are you positive that those happened at work, or could they have been together like outside of work?

Gottesman: Right. A few of them were people who either carpooled together or roomed together and also worked together. Our presumption is that the transmission is more likely to be outside of work than at work because work was a much more controlled environment. The other thing about the NIH, which I think has been underemphasized, is that because we are a research establishment, in both the hospital and in the laboratories the airflow is adjusted so there's no recycling of air. The air you breathe out goes right out of the building; it doesn't get recycled. For buildings, office buildings in particular, in which that isn't the case, you're more likely to see transmission just from the respiratory route. We thought our buildings were pretty safe. We designed the hospital with single pass air, and I remember the discussions about that because it was going to cost a lot more money because it's not efficient. You heat the air and then you blow it out the smokestacks. It's easier to reuse the air and use filters, but we decided early on in the design of the hospital because we had so many immunosuppressed patients that we would use only single pass air. Most of the research buildings at NIH are quite safe buildings, and the ones that are office buildings were very careful in terms of the filters that they used and so on and so forth. And of course, as you know, very few people were in the office buildings at that point.

Barr: What was your experience like with your own laboratory which for a short time was not open to on-site research? How did you support and advocate for your trainees during this period and how did

your particular situation influence how you approach the issues that people are facing throughout the NIH?

Gottesman: I had the advantage then and I sort of have the advantage now of having a very broad perspective on what goes on at the NIH. I met a couple times a week with the people in my laboratory. Those were remote meetings. People were not coming in. I assured them that every effort is going to be made to allow people to come back as soon as it was safe. I gave them information about what they needed to do to keep themselves safe outside of the NIH. And we had discussions about science. We had journal clubs. We had many opportunities to talk about publishing papers. It's interesting – if you look at statistics for the first year of the pandemic, the publication rate at NIH actually went up, which we presume reflects all those papers that people had in their desks that they needed to finish writing and they did. The second year it went down reflecting the fact that there'd been almost a year without a lot of productive laboratory research. We are, I think, coming out of that period and hopefully in the future we'll be back to more of a baseline level of productivity. It's very interesting. You can sort of track the access of people to their laboratory settings and clinical settings. Clinically also, even though the hospital was open to take care of sick patients, a lot of the more elective trials were closed and the capacity to travel people in was much reduced and a lot of our clinical investigators for a couple years and even till this day have reduced capacity to do clinical research.

Barr: Can you talk about some of the ways you tried to keep up morale amongst all the different IRP staff? I mean you had some that were home feeling very useless. You had some on campus non-stop doing science or like the veterinary care people that had to go in during a very unsafe time. So how did you convey upbeat messaging to all these different groups?

Gottesman: I would say I was part of NIH leadership that really made an effort to reach out. As you may remember, there were many town hall meetings. We used to meet every Tuesday evening at six o'clock with all of the leadership of NIH – the executive officers, the deputy directors, the directors, the scientific directors, the clinical directors – and give them updates on everything that was happening so people felt like part of the decision-making process. They could ask questions. They could make suggestions so at the leadership level people were engaged. I met and I continue to meet with a lot of the major interest groups at the NIH. One of the major ones that I began to meet with weekly was the Assembly of Scientists. This is a group that represents all the scientists at the NIH, and we met weekly. They would send me a list of questions – many of them turned out to be questions for Alfred Johnson because they were management related questions. “How do you get in? How do you get tested?” Alfred and I used to meet with the Assembly of Scientists and do our best to answer their questions and listen to their suggestions because there's not a scientist at NIH who doesn't think that whatever we do, they could do it better. And in many cases, that was true.

I want to relate kind of an anecdote. Ad Bax, who was a very senior scientist in NIDDK [National Institute of Diabetes and Digestive and Kidney Diseases] was coming in to do experiments looking at the effect of aerosols and how to measure aerosols coming out of people's mouths and noses and the effect of masking on those aerosols. He had worked out a technique for visualizing very small particles coming out when people spoke, certainly when they coughed or sneezed, but even if they spoke, and he showed unequivocally that you could reduce by 90-95% the aerosols just by putting something over the face. At that point, which was really early on – it was in the spring of 2020 – the CDC had not yet recommended masking. You may remember even Dr. Fauci was not that enthusiastic about it. He [Bax] and I went to Dr. Collins and said, “Look here are the data. It looks pretty clear that a simple mask (and it didn't have to be complicated – it could be a cloth mask) would make considerable difference in the

spread of disease." That data and other data came to the CDC, and they then finally decided that masking was a good idea. Now there were political implications obviously, and there still are. People more and more are refusing to wear masks under circumstances in which they could probably prevent transmission not only of SARS-CoV-2, but influenza that is circulating now, [and] respiratory syncytial virus, etc. So, all kinds of respiratory viruses could be defended against with some masking in public places. There are countries in this world where masking is quite common during flu season – in Japan and China – but it's not customary in the United States and really hard to convince people to wear masks. People at NIH still wear masks in public spaces and in their seminar rooms when they're talking to each other in the laboratories. In my lab, pretty much everyone is masked. We have a big lab and people wear masks during the day, and when they leave, they take them off. But people are cautious. We can't mandate it, but we can advise, and you've seen signs saying we encourage people to wear masks and they do by and large at NIH because this the National Institutes of Health after all. Of course, masks were required in the Clinical Center where the patients are, and you could not enter the building without obtaining a clean surgical mask.

Barr: What were some of the other suggestions that came through this group?

Gottesman: There were issues related to vaccination. Initially we wanted everyone to be vaccinated, and initially there was a requirement that came from the president saying that all federal employees needed to be vaccinated. Then there was a legal decision by a judge in Texas that we could not mandate vaccination. We certainly couldn't mandate it for our contractors who were about half of our staff, not the intramural program but the NIH writ large. We try to make do as best we could. NIH provided the initial vaccines for people who were interested before they were readily available commercially, and now since they've been available, I think we expect people to go to their local pharmacy or physician to get the boosters. But initially NIH was providing that. That was one thing we discussed endlessly. We talked about testing. There was a big discussion about whether we needed nasal swabs or saliva, and now if you've gone over to building 10 for asymptomatic testing they ask you, "Do you want a nasal swab or saliva?" Turns out a lot of people cannot produce saliva on demand, so most go for the nasal testing. They turned out to be roughly equally effective in detecting disease. We thought initially that having nasal probes would be an impediment to getting people tested, but I think most people have gotten used to it. There used to be retropharyngeal swabs which go way back to your nasopharynx, but now they're mid-nasal and not nearly as unpleasant as that was. We had discussions about that. We talked about the local environment – what the risk was. We had, through it all, a pretty good measure of what the incidence was of asymptomatic people because we were testing about a thousand or more people a week at the NIH. Generally, the rate of positives in people who didn't know that they were positive or who thought they were fine was on the order of one to two percent or less.

Barr: That's good.

Gottesman: Yeah, it's pretty good. On the other hand, if you're in a room with 100 people odds are pretty good one of them has COVID and doesn't know it. That's why the big groupings are really most dangerous. Statistically, the likelihood that somebody's there sneezing, coughing, breathing, talking, creating aerosols that could be infectious is much greater. You may remember that there was a Biogene conference in Boston early on which turned out to be a super spreader event. There must have been a couple of positive people and a huge high percentage of the people at that meeting-

Barr: Got really sick and spread it.

Gottesman: Yeah. They were coming from all over the world, and they then went back. The other example of that was in a town in Austria, a skiing resort, where there were bars and people were going to the bars after skiing. That was one of the early sources of the virus in Europe, and then they went to their home countries and a lot of the cases in Europe could be traced back to that initial group of a couple of hundred people who had been skiing and then spread out throughout the rest of Europe. There are a lot of other examples of that kind of thing, and now people are back to socializing in large groups and without masks and this disease is not gone yet I'm afraid.

Barr: How are you involved in allocating the intramural targeted anti-COVID-19 awards, a program supported by NIAID with 12 million dollars that funded 40 projects from the 159 proposals?

Gottesman: This idea came out of our office. We discussed the fact that it would be really useful. You have to realize that the money for COVID-19 went to a couple of institutes at the NIH. Some NHLBI [National Heart, Lung, and Blood Institute], some NIAID (mostly NIIAD), and all the other institutes got no money to do COVID research because that was not their primary mission. We had all these investigators at the NIH who wanted to do COVID research but no extra money for them. So, we said, "Why don't we have a program that at least allows them to compete for funds that will encourage collaborative research across the NIH and new approaches." We did in fact have 159 people who applied. Many had good projects. We ended up funding 40. It is true that the original allowance was 12 million dollars, but because we had more projects than we could fund, I went back to Steve Holland and I said, "You probably have a little extra money that you can give us." And he did, and he was enthusiastic. He was really wonderful. We got, I think, two, three, or four (I don't remember exactly how much more than the official money), so it was more than 12 million dollars, and it got distributed to the most highly rated proposals. We set up a committee as we always do to review the proposals, and they rated them. We asked Ted Pearson who's a virologist and NIAID senior investigator to chair the committee, and he did a wonderful job of organizing it [and] giving us a rated list in order of priority of the projects. Then I made the decision about which ones would be funded, and we supported quite a lot of research that might have been otherwise difficult to do at the NIH.

Barr: Do you think there'll ever be a program like this one on a smaller scale that would build on this initial research and would include more behavioral, mental health, and addiction studies in conjunction to studies that look at the virus and therapeutics to quash it? When this program was set up, the pandemic wasn't well underway. Some of the mental health stuff came later, and it's not as represented in the 40 projects that got funded.

Gottesman: My office has multiple ways to support trans-NIH initiatives. We try to find collaborative studies that involve more than one institute because, obviously, within an institute, there's money to support research. One thing we have is the Director's Challenge Awards, which is about 1.8 million dollars. We do that every other year, and they're two-year grants. In this last cycle, we focused on bioengineering because we were beginning a bioengineering program at the NIH, but every couple of years we try to pick a theme that has Public Health urgency – that would help people do experiments they couldn't otherwise do. A few years ago, we supported a project on what we call obsessive brain disorders. These are behaviors that are not in the interest of the organism, but behaviors that are hard to control. Behaviors like obsessive-compulsive disorder, alcohol and drug abuse disorders, and obesity are considered obsessive brain behavior. There about seven or eight, maybe even more, institutes that got funded through that to create a joint program, and then that was so successful because they recruited postdocs and trainees and bought equipment and they worked together in various ways. The idea was to start the project, and then have the institutes continue to support it. That's an example of a

behavioral science project that began with Director's Challenge grants, and so we have money to do that sort of thing.

The other thing we do is to facilitate interactions within institutes and provide space, sometimes, and support. I don't know if you know about Avi Nath's work on chronic fatigue syndrome. Avi immediately picked up that long COVID, which is really devastating for lots of people who've had COVID, had a similar set of biological phenotypes, and so he began a study on long COVID and neuroinflammatory effects of the virus. That was supported mostly by NINDS [National Institute of Neurological Disorders and Stroke] which had some funds for that, but also with the help of other people at the NIH. There are other ways to support these sorts of projects. I would hope that the institutes that have an interest in behavioral research at the NIH, NIDA [National Institute on Drug Abuse], NIAAA [National Institute on Alcohol Abuse and Alcoholism], NIMH [National Institute of Mental Health], and NINDS to some extent, would continue to support pandemic-related research.

The intramural program fills a unique niche. We can do long-term studies which are going to be essential for long COVID. They're not just three-year studies; they have to be 20-year studies. Are some of the people infected now going to come down in 20-30 years with some other neurological problem? That has happened with influenza and encephalitis lethargica where 10 years later patients got parkinsonian symptoms. You don't know what's going to happen, and that requires a long-term commitment. Long-term commitment, special resources, and just the brilliance of our talented scientists coming up with hypotheses and experiments to test those that could add to knowledge. A lot of what I do as DDIR is that I'm a cheerleader and a matchmaker. It's not all about money; it's sometimes bringing the right people together.

Barr: If such funding was ever available again for COVID, what areas would you like to see represented being studied by the institutes?

Gottesman: I really think that we have to invest quite a lot in long COVID syndrome and also in chronic fatigue syndrome (also called myalgic encephalomyelitis or ME/CFS , which presumably is also a post-viral syndrome. Many people who have ME/CFS describe having a viral illness and then never being the same again, and that's what we're hearing from some of these long COVID sufferers. I think that's a really good thing for the NIH to work on. I think the vaccine and treatment issues are not even close to being solved. We have a great vaccine to prevent severe disease – there's no question about that – but it doesn't prevent spread of the disease. To have a vaccine that could actually prevent spread, it may have to be a nasal vaccine or something like that. The treatment is pretty good; Paxlovid is a pretty good oral anti-viral agent, but you've heard about issues with it. And more studies are needed on pathophysiology. This is disease in which we don't fully understand how it works, why the presentation is different for different SARS-CoV-2 variants, why it causes neurological symptoms without invading the brain, and all kinds of inflammatory issues. We need to understand more how the immune system reacts and why the physiology of people who've been infected is so changed. There's a lot of long-term research that could be done, and the intramural program is a great place to do it.

Barr: Yes. In addition to the ITAC [Intramural Targeted Anti-COVID-19] awards, there's been over 400 intramural COVID projects with 313 principal investigators or probably more at this point. Can you talk a little bit more about how you help support and guide all these intramural COVID efforts? Are there any particular studies or trials that you wish to highlight?

Gottesman: Relatively early on in the spring of 2020, we appreciated that we needed to coordinate efforts across the intramural program. The way we chose to do that was – and you had a question about this as well – to sort of create this scientific interest group. We asked people who would be interested, and we went to people who we thought would be successful in organizing this. We wanted virologists, immunologists, epidemiologists, and, in particular, I asked Pam Schwartzberg, who was the first director of this effort, to get together a group of people and to start to think about a more uber effort to understand this disease. Out of that came this symposium. There have been symposia with the FDA, but also almost weekly seminars on COVID from NIH investigators and people not at the NIH who would come.

Barr: Yeah, they're great.

Gottesman: They are. They continue to be great. I don't know if you went to the one this week. It was spectacular. It was about the immune response to natural disease and to vaccination at a very detailed level. What happens to T cells, what happens to antibodies, what happens to memory cells, where are they, what do they do, to how long do they last. All of which is critical information to figure out strategies for dealing with the disease. We've had a series of really spectacular talks, and I think it influenced both our understanding and our interest in pursuing research.

The other thing that happened is we wanted to set up a dashboard so that we knew what people were doing at the NIH. It was not just what the research project was but what resources they had that could be shared with other people. At the same time, NIBIB [National Institute of Biomedical Imaging and Bioengineering] was doing this more globally for all NIH supported research. We combined forces and we created a database for the intramural program. I don't know if you've ever tried to access it, but it's really useful. You can put in a subject and find out everybody who was working on it. You can put in a reagent and find out who has the reagent. This was sort of information sharing/communication stimulated collaboration, and we eventually made this available – not initially because we weren't supposed to or allowed to – to all intramural scientists who are interested in learning what was going on.

One thing we tried to do was to create a repository for samples from patients that could be accessed for people, and NCI [National Cancer Institute], which has very extensive repository capability up in Frederick, was going to help and people were going to put in their samples. They would then be pulled out as needed, but virtually nobody did that. They were willing to share but they weren't willing to put things into a repository which I think is quite interesting. I consider that a failure. On the other hand, it wasn't as if the samples weren't made available – they just weren't as easily available as they might have been otherwise. One of the questions you asked me, and this is relevant here, was what else could we have done and what were the lessons learned? I'm not generally in favor of top-down approaches, but I think we probably could have gotten a working group together to think about really big questions that needed answering and organize efforts involving multiple laboratories to answer those questions. Some of that has happened naturally because the scientists at NIH are interested in big important questions. For example, what percentage of people in the United States have antibodies to COVID-19? Is it a 100% now? Is it 80? And what has it been? It turned out early on that far more people had antibodies than knew that they had been infected.

Barr: Yeah. That was so interesting.

Gottesman: Normally the vaccine makes antibodies against the spike protein, the G protein, and those are pretty easy to detect. Natural infection gives you a wider array of antibodies against other parts, so you can tell natural infection from vaccine-induced infection. Those data are still being collected, and hopefully there'll be a big paper coming out about the evolution of the infection across the country. Another really big question is why the United States has fared so poorly compared to many other countries. I think we need to answer that question in order to prevent another disaster with the next pandemic. Was it that people were not careful about their behavior? Was it something about the susceptibility of our populations? Something about how we congregate and how we socialize? There may be some countries where people were exposed to many different infectious organisms, more so than in the United States. Maybe there was a sort of natural immune stimulation that – I'm just speculating. Why weren't more people dying in Africa where you'd expect that there would be a really grim effect of this virus, but yet it wasn't as bad as expected? I mean people did get sick and people did die, obviously, but the per capita rate was below that in the United States where we had vaccines and masks and treatments and really first-class intensive care hospitals. We need to understand why we did so badly in the country as a whole, and that probably begins as an epidemiology project. We have a lot of great epidemiology at the NIH, so hopefully that's something we can do as well.

Barr: There's been starts to that work, some of them in the intramural research program.

Gottesman: Right. Absolutely.

Barr: About Americans being so unfortunately overweight and unhealthy in our lifestyles, we fared much worse with COVID than other populations that are not as unhealthy in their lifestyles.

Gottesman: Yeah, that's absolutely true. Obesity is definitely a factor. We also have a pretty a big aging population, and many of those people are institutionalized in nursing homes and other facilities and those were very hard hit by the epidemic with high death rates in many cases. That's certainly a consideration.

Barr: In America, there are a lot of people who do not really get sick days. That is not a thing. How much has that factored in?

Gottesman: A lot of the people who were hardest hit were in the demographics of people who were wage earners, blue collar workers, people whose livelihood depended on going to work. The bus drivers, the sanitation workers, the police, the firemen, and so on. The NIH was similar in that those people who had to come to work tended to be much more susceptible to disease. I don't know that that's not the case in other countries, but you're right; it may be more socioeconomic in the United States than it is elsewhere.

Barr: Can you discuss your part and conversations around return to work amongst the intramural scientists and staff and how priorities and exceptions to the guidelines were set up and established?

Gottesman: We were worried early on about the careers of our scientists here. At the senior level people are expected, because they're evaluated on a regular basis, to be productive, and we have outside groups that come in and they determine whether somebody has produced enough to get a promotion or to have their research continue to be supported. We were particularly worried about our tenure track investigators because they are on a clock. They're not here forever, and in six, seven, eight, nine, ten years, if they're not producing anything, they're likely to suffer some consequences. We

wanted to make sure that our Boards of Scientific Counselors were sensitive to this issue. We're aware of it, and we're willing to give people the opportunity to talk about how the pandemic had affected their work. Some labs were affected much more than other labs for sure. In particular, we were very worried about women at the NIH who in addition to the expectations in terms of their laboratory work frequently were asked to bear a burden at home in terms of childcare and so on. Kids were not going to school early on. It is hard to do very sophisticated work with a child bouncing around your head all the time, as I can attest. We worked really hard to make sure that people would have some quiet time to come into the labs even though they weren't supposed to be in the labs. We tried to make as many exceptions as we could and convince each of the institutes who had slightly different policies to be sensitive to this issue of allowing people, particularly at a stage in their career where they needed time, to come in. Many people had offices so there's no particular risk for them; it's just that we had these personnel rules about coming in if you weren't working on COVID or mission critical work. For the postdoctoral and post-baccalaureate fellows who weren't here for all that long, they needed to do something to move on with their careers. We allowed extensions of appointments. Most post-docs are limited to five years, but we've allowed extensions to six and seven years and post-bacs from two to three years in some cases depending on circumstances. We don't want people to be here and just hanging around; we want them to be able to do something that'll allow them to move on in their careers, so we were pretty flexible. I think that that helped reassure people. There were also all these mental health efforts organized by Maryland Pao in NIMH and Sharon Milgram in the Office of Intramural Training and Education in terms of remote group meetings to talk about the stresses and strains of living through the pandemic, and I think that helped a lot of people as well.

Barr: Definitely. What in your opinion were some of the pros and cons of an increased virtual work environment and virtual events? Like the research festival became virtual for the poster sessions.

Gottesman: I think the pros are fairly obvious. It allows a much larger group of people to engage in an activity including people who aren't on site. We can now employ really talented people who are in Denver or Southern California or Chicago to do work on an equal basis with other folks. We'd always done that, but it became a lot easier as it became standard. I think the other thing which has been pointed out is we have a lot of scientific seminars, a lot of scientific meetings, and having remote access makes them far more democratic. If you're an economically disadvantaged person living in the South of this country, you can still tune into the NIH lecture from a Nobel Laureate, which you could never have done if they were only in person. I think the continuation of these activities, the meetings and the seminars and so on, is likely to continue because it really does make things much more available. I have to say the Wednesday Afternoon Lectures were always archived as were other lectures and were available throughout the world, and about half of the people who watch our lectures are not in this country. People are aware of the quality, but now everybody knows that you can always listen into a lecture at a top institution such as the NIH in real time.

The cons have to do with the disadvantages of not having in-person meetings. Not being able to read body language means that communication is sort of stilted. Not being able to have those little side conversations that lead to creative and wonderful ideas. I'm in the lab now full time – I mean I come in every morning, and I leave in the evening – and just the interactions that I have with people in the lab are infinitely more productive than what was possible when we met in a sort of routine way on a regular basis remotely. There's nothing that replaces those human interactions, and I think from the mental health point of view, having an opportunity to interact with other people eliminates loneliness. A lot of the fellows who come here live by themselves in apartments, and sitting there all day without any human interaction can't be a healthy thing for most people, particularly young people who really need

those interactions. Those are the major cons, and I think we'll end up in a hybrid world. More and more people will come together in-person, but there will be opportunities for us to also bring in a wider community from remote access.

Barr: For sure. What were some of the challenges with the pandemic for you and your team, and what were some of the opportunities? You have dealt with many issues throughout your tenure in NIH from the radio isotope incident to the personnel incidents when you were at NHGRI [National Human Genome Research Institute]. How did you use those lessons to deal with the pandemic?

Gottesman: I've heard from people that I'm a reassuring presence, and so I will try to be present as much as possible. I do that by meeting directly with individuals and groups of people. There are all kinds of groups that I met with. I mentioned the Assembly of Scientists, Women Scientists Advisors, subcommittees on women in science, and all kinds of groups of minority investigators who were particularly worried about the circumstances of the pandemic just to listen to hear what's on people's minds, to develop ideas to alleviate some of their concerns, and to assure them that this too shall pass. That we will be getting back to normal, and maybe the new normal would be a better normal, and there'd be opportunities for hybrid activities. The lessons that we learned about how to interact with people would be useful ones.

I think the main challenge was maintaining morale and a sense of stability in the face of what was really a devastating set of circumstances. Also, one thing we talk about a lot is transparency, and I think it was really important to let people know if we had a policy what was the reason for the policy, what we were concerned about, how it would be executed, and to engage people as much as possible so they felt part of the solution rather than the target of the solution. All of those were important things to sustain morale. Opportunities – we mentioned the new way in which we have of communicating by Zoom and other means. The technology has advanced to the point where it's relatively reliable; it's not 100 % reliable, but it's much better, I think, than it used to be, and we're comfortable using it when we need to. I rarely have phone conversations anymore. I used to mostly have phone conversations, but now [Gottesman gestures towards the camera/screen and laughs] like we're having this conversation. Although I'm not so far away from The Cloister, and I could have come over there, or you could have come over here for that. [laughter] But it was just easier to do it this way, and I think that's fine.

We've also heard from the people who do reviews. NIH uses about 10,000 reviewers a year to review grants and to review our intramural program. They are much more likely to say yes if you ask them to review something if they don't have to travel for two days to get to a one-day review. I think that's a real plus.

You asked me about my personal interactions. I used to go several times a year to universities to give talks about my work, and it doesn't make sense to me anymore to do that. If they will allow me to speak remotely, I can meet individually with people. I can talk about my work and avoid two days of travel for four hours of conversation. I personally think that's a change in my own work style which has been a good one. The other obvious change for me has been that I'm no longer deputy director for intramural research [laughter], and I would say the decision was probably made before the pandemic, but the pandemic cemented it. That it was time for somebody else to deal with all of these issues. I have to say I've been in the lab since August, and it's just been a delight. I benefit from everything I learned from people at NIH over the last 30 years, and I don't regret for a moment doing it, but I think it's time to move on.

Barr: Have you gotten a chance to do more things that you enjoy doing like being with your grandkids? I know you have a few grandkids?

Gottesman: Yeah, so Gabrielle, people said to me, “Never say when you step down from a position in the government that you're doing it to be with your family, because if you look at the paper, and somebody says that, within a week they've been indicted for some high crime or misdemeanor.” [laughter] I'm not guilty of that, but it is true. I do have a lot more time to spend with my family. What I've discovered – my wife is also working full-time, more than full-time as we both are – a plumber had to come to the house yesterday and Susan said, “I'm sorry I'm busy,” and I said, “Oh, that's okay. I can manage.” I rearranged my schedule, and I could never have done that in the other job. My time was not my own. I just didn't have any control over it, and I had 10 meetings a day. My wife Susan was bearing the burden of all these plumbers and electricians and anything that needed to be done at home, and so now I can carry my weight. I am pleased about that.

Barr: I am sure she's appreciative.

Gottesman: Right. I mean if I'm sitting waiting for a plumber, I can write papers, I can read papers, I can have conversations with people, but I couldn't do that before in my other job.

Barr: How did you yourself stay sane during the busyness of the pandemic?

Gottesman: You're making an assumption that I have actually ever been sane. I don't know. At no point did I feel under enormous stress. I tend to be risk averse in general, and we we're pretty careful. We've done some traveling, but we always wear masks, and we are very frequently the only people in a place wearing masks. It's a somewhat strange experience, and I don't understand why that's the case because anybody who realizes what the risk is and the inconvenience of wearing a mask is so small compared to the risk. I don't understand it entirely, but people are just finished with this pandemic. They want to think that things are okay. I mean I think there's a little stress associated sometimes with social activities which used to be you wouldn't think twice about it. Now – is it inside? Is it outside? Who's going to be there? And that kind of thing.

Barr: Is there anything else that you'd like to add either about your time during the pandemic or about your experiences at NIH as a whole?

Gottesman: I don't think so, except that I really love this place, and I'm really pleased that I've had an opportunity to help people live through the last couple of years. We say you should think globally and act locally; it's now my time to act locally to support the people in my own lab and the research we're doing here. I'm always available to consult. People still call me up to ask for advice, believe it or not. I don't have control over anything, but I actually never had that much control over anything before. It was mostly who do you know and who you get to help and who has the information that's needed to solve a difficult problem. Anyway, it's been great and I'm looking forward to many more years at the NIH for sure.

Barr: Thank you very much.

Gottesman: No thank you for doing this. One person you really should talk to is Steve Holland because he played an instrumental role in a lot of the things that we've been talking about, and I'm sure he

would be very pleased to give you an interesting interview. He has a great sense of humor, and he'll tell you what's going on in NIAID.

Barr: Definitely. Thank you.