CHEMICAL HERITAGE FOUNDATION

CARLYLE B. STORM

Reflections on the Gordon Research Conferences

Transcript of an Interview
Conducted by

Arthur Daemmrich and Arnold Thackray

at

Gordon Research Conferences Headquarters
West Kingston, Rhode Island

on

22 August 2002

(With Subsequent Corrections and Additions)

ACKNOWLEDGEMENT

This oral history is one in a series initiated by the Chemical Heritage Foundation in collaboration with the Gordon Research Conferences. The series documents the perspectives of key individuals who organized and managed the Gordon Research Conferences and records the Conferences' impact on scientists' research, careers, and lives.

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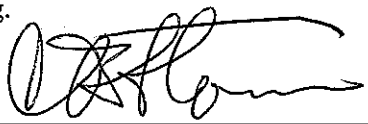
(Signature) 
Carlyle B. Storm

(Date) 10/14/02

Chemical Heritage Foundation
Oral History Program
315 Chestnut Street
Philadelphia, Pennsylvania 19106

CARLYLE B. STORM

1935 Born in Baltimore, Maryland, on 2 March

Education

1961 B.S., chemistry, Johns Hopkins University
1963 M.S., chemistry, Johns Hopkins University
1965 Ph.D., organic and biochemistry, Johns Hopkins University

Professional Experience

Howard University
1968-1970 Assistant Professor of Chemistry
1970-1973 Associate Professor of Chemistry
1972-1985 Consultant, Center For Sickle Cell Disease, College of Medicine
1973-1986 Professor of Chemistry
1976-1986 Graduate Professor of Chemistry
1982-1985 Adjunct Professor of Biochemistry

1972-1985 Consultant, General Research Support Program Advisory Committee, National Institute of General Medicinal Sciences
1974-1975 Senior Visitor, Inorganic Chemistry Laboratory, Oxford University, UK
1975-1985 Consultant, Minority Biomedical Research Support Program, National Institutes of Health
1977 Visiting Professor, Department of Chemistry, University of Trondheim, Norway
1978-1985 Assistant Editor, Down Syndrome, Papers and Abstracts for Professionals

Los Alamos National Laboratory, Los Alamos, NM
1981-1982 Visiting Staff Member, Stable Isotope Research Resource
1985-1989 Staff Member, Explosives Technology Group, Dynamic Testing Division
1989-1992 Program Manager for Materials Research, Dynamic Testing Division
1992-1993 Chief Scientist and Program Manager for Technology Development, Explosives Technology and Applications Division

Research Center for Energetic Materials, Industry Advisory Board, New Mexico Institute of Mining and Technology
1989-1993 Member

1991-1992	Vice Chair
1992-1993	Chair
1991-1993	Consultant, TELTECH
1993-present	Director, Gordon Research Conferences
1994	Chair, Naval Studies Board, Panel on Research Opportunities in Energy Conversion

Honors

1959	Phi Lambda Upsilon
1961-1962	Gilman Fellow, Johns Hopkins University
1962	Sigma Xi
1962-1965	NIH Predoctoral Fellowship, Johns Hopkins University
1965-1966	NIH Postdoctoral Fellowship, Stanford University
1966-1968	Staff Fellow, National Institute of Mental Health
1973-1978	Research Career Development Award, National Institute of General Medical Sciences
1974	Presidents Award, Maryland Association for Retarded Citizens
1977	Senior Fulbright-Hays Fellow, University of Trondheim, Norway
1982	Washington Chemical Society Community Service Award
1988	Chair [Founding], Gordon Research Conference on Chemistry of Energetic Materials
1992	Sigma Xi Lecturer, Army Research and Development command, Dover, NJ
1992	Invited Speaker, Gordon Research Conference on the Chemistry of Energetic Materials
1997	Fellow, American Association for the Advancement of Science

ABSTRACT

Carlyle B. Storm begins the interview describing his family background and chosen academic path. After obtaining his PhD, Storm became a professor of chemistry at Howard University, and worked to secure funding for research. In the early 1980s, he accepted a position at Los Alamos National Laboratory, where he researched conventional high explosives as chief scientist, becoming program manager in 1989. Storm first attended Gordon conferences in the early 1970s, and in 1988, founded and chaired the Energetic Materials Conference. Storm's experiences managing scientists at Los Alamos and working with non-profit boards uniquely qualified him to become the director of the Gordon Research Conferences in 1993. As director, Storm traveled to many conferences, improved administrative processes, and evaluated the economic, participation dynamics, and governance of the organization. Under his leadership, the conferences expanded across the country and the globe. Storm has worked hard to ensure that each conference follows the Gordan format and brand image, no matter where in the world it is. Storm feels strongly that graduate students should participate in the conferences, and has encouraged their participation through programs such as the Gordon-Kenan Summer Schools and Graduate Research Seminars. Additionally, he has considered developing a permanent facility for the Gordon Research Conferences. Storm concludes the interview by recalling scientific advances that have been realized as a result of the interaction among leading scientists at the Gordon Research Conferences.

INTERVIEWERS

Arnold Thackray is President of the Chemical Heritage Foundation. He majored in the physical sciences before turning to the history of science, receiving a PhD from Cambridge University in 1966. He has held appointments at Oxford, Cambridge, Harvard, the Institute for Advanced Study, the Center for Advanced Study in the Behavioral Sciences, and the Hebrew University of Jerusalem. In 1983 he received the Dexter Award from the American Chemical Society for outstanding contributions to the history of chemistry. He served on the faculty of the University of Pennsylvania for more than a quarter of a century. There, he was the founding chairman of the Department of History and Sociology of Science, where he is the Joseph Priestley Professor Emeritus.

Arthur Daemmrich is a policy analyst at the Chemical Heritage Foundation in Philadelphia. He holds a PhD in Science and Technology Studies from Cornell University and has published on biotechnology policy and politics, the sociology of medicine, and pharmaceutical drug regulation. In his research, he brings long-range perspectives to bear on the analysis of globalization, risk, health, and environmental policy. Daemmrich has held fellowships from the Social Science Research Council/Berlin Program for Advanced German and European Studies, and the Kennedy School of Government at Harvard University.

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LOCATION: Gordon Research Conferences Headquarters
West Kingston, Rhode Island

DATE: 22 August 2002

DAEMMRICH: Carl, why don't we start with a bit of your personal biography? Tell us about your parents and family background, and where you grew up.

STORM: Well, I was born and raised in Baltimore, Maryland. Both of my parents were raised on farms in rural areas—my father on a farm in rural Virginia and my mother on a farm west of Baltimore. My father moved to Baltimore while he was in high school. He graduated from Baltimore City College, which is a high school in Baltimore. He went to work for a bank and got a law degree at night school while working for the bank. He eventually founded and ran the trust department for the Union Trust Company in Maryland. So he was from, let's say, a very modest background, but he was successful in the Baltimore banking industry.

My brother and I were the first two in the family to get a university education. We both got our undergraduate educations at Johns Hopkins [University]; I stayed on and did my master's and PhD degrees as well. The family was quite enthusiastic about us getting a higher education, but after my staying on for a PhD and then three years of post-doc, they eventually became quite concerned as to whether there ever would be an end to this. [laughter] So after Hopkins, I went to Stanford [University] post-doc for a year with Henry Taube and then went to the NIH [National Institutes of Health] and spent a couple years as a staff fellow in the neurochemistry laboratory. My intention was to research the function of metal ions in biological systems, and inorganic biochemistry was being invented during that period of time. People like Bert [L.] Valle at Harvard [Medical School] and Harry [B.] Gray were just going into it at about that same time. After a couple of years at the NIH, I moved to the chemistry department at Howard University in Washington, D.C. I stayed there for seventeen years with sabbaticals and side trips to [University of] Oxford, [England], the University of Trondheim (1) in [Trondheim] Norway, and Los Alamos [National Laboratory]. Then, in 1985, I moved to Los Alamos to become a member of their technical staff.

DAEMMRICH: Perhaps we could go back just a little bit. When did you first develop an interest in chemistry? Was this as an undergraduate?

STORM: Actually, when I was in sixth grade in elementary school I decided I wanted to be a chemist, [laughter] and I never really wavered from that. My ambition was always to be a research chemist for DuPont [E.I. duPont de Nemours and Company], but I never realized that connection to industry.

THACKRAY: Did you have a chemistry set?

STORM: Well, I certainly had a chemistry set. I had a classic Gilbert chemistry set. And it upset my family to no end with the smells and the things that I used to make in the basement with that. [laughter]

I did a book report when I was in the sixth grade. It was kind of a fantasy thing—*A Trip to the Sun*—and it was very successful. My sixth grade elementary school teacher then had me go around the whole damn school, giving this book report to all these different classes. [laughter] I guess that was quite impressive. In the eighth grade, I had a very good general science teacher and that was very encouraging. Then in high school, I had a very good chemistry teacher. He was actually a PhD chemist who was stuck in Baltimore for a couple of years because of some family situation, and he was also very encouraging. I think that all reinforced the idea.

It was the family opinion that you had to do something practical, so when I went to Hopkins, it was as a mechanical engineering major, and I stayed there a year and a half. Then I spent three years in the regular army. When I got out of the service, I was up at Fort Devens, Massachusetts, and I went to work for Foster Grant [Corporation] in Leominster, [Massachusetts], and I worked in their pilot plant in the research lab for about eight or nine months. Then I went back to Hopkins, and by that time I had decided that whether chemistry was practical or not, that was certainly what I was interested in. Then, during the additional three years it took to complete my undergraduate education, I became convinced that going to graduate school was a good idea, so I just stayed there and did my graduate education as well. So it was a steady evolution to chemistry.

THACKRAY: Was there any problem financing your education?

STORM: Not really. That was a time when educational support from the government was really beginning to come on-stream. When I first went to Hopkins, I'm pretty certain the semester's tuition was one hundred and fifty dollars. Although that was worth far more money than it is now, it's nothing like thirty-five thousand dollars. I was married after I got out of the service. My wife [Lee A. Gordon] was a nurse, and I used to work as a mechanic part-time. My parents were helpful, and with what my wife. earned as a nurse, undergraduate school was affordable. At that time, you could get support from the NIH by writing a research proposal. It's very much like an R01 [Research Project Grants] grant is today for the NIH, so I wrote a

research proposal on the coordination chemistry to metalloporphyrins, which was funded for three years. (2)

THACKRAY: This supported your graduate studies?

STORM: Yes. And then I wrote another proposal to get a post-doc position at Stanford [University], which was awarded. (3) We had twenty-seven hundred dollars for a year. [laughter]

DAEMMRICH: For the proposal that funded your graduate studies, with whom were you working? What inspired you? Did you simply finish your undergraduate studies and decide to write a research proposal?

STORM: Well, I was already working with Alsoph [H.] Corwin on metalloporphyrins as an undergraduate. I had done undergraduate research. This is something I endorse about higher education at Hopkins. If you got As in your freshman chemistry lecture and laboratory, then you didn't have to take the lab in your second semester. You could do research with a faculty member. It was the same thing for organic chemistry, so I was doing research with graduate students and post-docs the second semester of my freshman year. I was a little more mature than many undergraduates because I had been in the service for three years. To me it was very excellent experience—by the time I graduated, I had three years of practical research experience with several different people in the chemistry department.

THACKRAY: You tarried just long enough along the way to really catch the post-Sputnik time.

STORM: Exactly. I still like the idea of a graduate student appealing to a place like the NIH on their own, because at that time I was working for an advisor and I had my own money. I was clearly not part of some big laboratory machine where you were going to put one more functional group on the side of a molecule as your contribution.

THACKRAY: So there's a whole period when you were becoming what you are—a classic academic research chemist.

STORM: Yes. And I reminisce on those times. You know, you used to make your own equipment. I learned how to blow glass. I made my own vacuum systems. You did things with your hands. I'm not sure that's true anymore in research labs.

THACKRAY: What made you think of moving away from Howard? Going to Los Alamos seems like a significant career shift.

STORM: Well, it was a pretty dramatic career shift, if you will. I went to Howard in 1968, and 1960s idealism was a heavy element of the environment. In fact, Wil [Wilbert C.] Lepkowski did a C&E News [*Chemical and Engineering News*] article on me and several other people about that time. I found the idea of combining a research career with teaching, and particularly teaching at a school that had a heavy minority enrollment, very exciting. Howard was just emerging from 1955 court decisions [Brown v. Board of Education, U.S. 294] requiring integration of schools. It had quite a good chemistry department—easily as good as the others in the Washington area—at the University of Maryland, Georgetown [University], and GW [George Washington University]. I had this vision of being able to run a good research group, teach, and do socially useful things all at once. It turned out to be a hell of a lot of work, because the university really was not designed to support research. So you had to go out and raise 100 percent of the money that you spent. The idea of having a startup package was unheard of. [laughter] A startup package maybe meant you got new blinds in your office or something like that.

The attitude of the research community at large was also not necessarily hospitable. Many people in the larger research community are very protective of their turf, and they don't particularly want to see new units established that are going to be competing for the same money. I had sent an application into the National Science Foundation earlier for an NMR [nuclear magnetic resonance] spectrometer, and it came back with referees' reports saying that the research proposal was excellent, the work was very good, but Howard University had no business owning a sophisticated piece of equipment like that. They feared it would last for a year and then it be pushed over in a corner because Howard couldn't afford to maintain it. You know, it was true in a sense, because this was not a university that had a lot of resources, and I think Howard didn't want to expand. If I got the NMR spectrometer, I would have been obligated to continue to raise money for it.

Another consistent response I would get when I approached mainline research sources was, "This person is probably the best scientist on the Howard faculty, but there are all of these other organizations that have money to support research at minority schools. If they're going to spend it on anybody, they should probably give it to him." But when I went to, say, the NIH MARC Program [Minority Access to Research Careers] or the MBRS Program [Minority Biomedical Research Report], they would all come back with language that said, "The purpose of this money is to transition research scientists at minority schools into mainline funding." [laughter] "Since you obviously have already been successful in that, why don't you go for an R01 grant at the NIH?" I would lay the two reports down next to each other, and not know where to turn.

Then, in the early 1980s, when [Ronald W.] Reagan got elected, he brought in Mr. [David A.] Stockman and others, who went through the U.S. budget and just hacked huge amounts of research money out. I just could not see the possibility of continuing to finance my research group. I had about fifteen people that I worked with at Howard and in the Washington area, and between $250,000 and $300,000 a year in research money that I was raising from sponsors outside of the school—and I just could not see that continuing. Los Alamos offered me a job that roughly doubled my compensation. So I moved from inorganic biochemistry to conventional high explosives at Los Alamos.

THACKRAY: How did you end up there?

STORM: Well, I did a sabbatical out there from1981 to 1982 with the Stable Isotopes Research Resource, which was an NIH-DOE [Department of Energy]-funded project to use carbon-13 and other stable isotopes like nitrogen-15, in biological research, principally by way of NMR. So I was there for a year doing that. I always did a lot of heterocyclic chemistry, and because of other projects in our research group, I knew how to put nitro groups on heterocyclic compounds. I began consulting with the explosives people about their synthetic projects. They needed a physical organic chemist—an NMR spectroscopist—so they made me an offer I could hardly refuse.

THACKRAY: You were getting interesting angles on the vision of the research community.

STORM: Yes.

THACKRAY: At Los Alamos you were 'chief scientist.' What was the sequence of your roles and jobs at Los Alamos?

STORM: When I got out to Los Alamos, I discovered that it is an extraordinarily isolated place. There are people that had literally been there since the Manhattan Project. They found out that, because of my years of teaching, that they could give me a set of viewgraphs I had never seen before on any one of a wide variety of topics, and twenty minutes later I could make a presentation to a DOE group visiting group Washington, for example, and sound like I knew what I was talking about. [laughter] So that was the end of my research career at Los Alamos. [laughter] You almost don't have the option of refusing those types of offers. In a big organization like that, if you want to prosper at all, you have to be a team player. You have to do what the organization values. So I moved into program management. I was soon spending one week a month in Washington in places like the Forrestal Building, and in Germantown, [Maryland], attempting to explain and interpret to people in the DOE what basic research was, and why investing money into examining how high explosives function would bring up safety

and performance issues that were of fundamental interest to the nuclear weapons program—specifically to the Department of Defense, and more generally to private industry.

THACKRAY: Was there quite a cadre of chemists at Los Alamos? I think of physics when I think of Los Alamos.

STORM: Actually engineers are the largest single professional group by far. Then, physicists are quite a large group. Chemists are then behind them in terms of number and distribution—from nuclear chemistry to synthetic organic chemistry to biochemistry to structural chemistry. But they're a significant group.

THACKRAY: What sorts of numbers of chemists are we talking about?

STORM: Well, there are about twelve thousand people that work at the lab. I think about twenty-five hundred or so of those are professional people, so there might be two hundred PhD-level chemists.

THACKRAY: So it really was different from Howard.

STORM: Oh, my word, yes. And when I got out to Lost Alamos, they had an old JEOL [Japan Electronic Optics Laboratory] 90 megahertz machine that was just dead on its feet. I said, "Well, why don't you buy a new one?" And people I worked with said, "Well, it just can't be done. You just cannot imagine the bureaucracy that you have to go through." So I went up to talk to our division office. It turned out I needed to write a one-page memo, which I wrote, and about two months later the deputy division leader himself comes down to my lab and apologizes—they couldn't fund it that year. [laughter] But, if I sent the request back in the following year, he was absolutely certain it would be at the top of the list. Again other people said, "Well, you can't buy it because the bureaucracy is too difficult." So I went down to the purchasing agents, which is a huge department. I sat down with one of them and I said, "I want to buy something. What do I have to do?" She gave me this long list of things that I had to do, and if I answered all the questions it would work. I got done talking with her, and she said, "You know, nobody has ever done this before." [laughter] I followed her directions, bought it, and it was delivered to the lab.

It's very isolated out there, and at the time it still had a culture hangover from the 1940s. The people don't speak to each other. They don't deal with each other. So, after about three years as a program manager, I was dealing with about fifteen million dollars a year in basic and applied chemistry and physics which related to the weapons program, shock physics, spectroscopy, synthetic chemistry, among others. That was largely based on being able to talk

to people and get along with them—going around and interpreting both what they were doing for the laboratory management, and what the laboratory management wanted of them. I actually discontinued funding to four or five people who had been supported by this money for years because they weren't doing anything. That created a huge flap. That had never been done before. [laughter]

THACKRAY: You could do that within the federal system?

STORM: Well, I just stopped supporting them. I didn't literally fire them from the lab. The money would come into a division. They would use it as a slush fund and redirect it to other things. After a year or so, I said, I've got better things to do with the money, and they lost that support.

Actually, winding up with the title of 'chief scientist' was a bit of a quirk. The lab had set up a very sophisticated testing program to evaluate materials, chemicals, and other products coming out of the Department of Defense. The theory was that they were going to be an honest referee. They had superb computational facilities and an x-ray that could take pictures of shaped charges going through metal and everything. They would look at everything that the Army, Navy, Air Force, Marine Corps and other DoD [Department of Defense] labs did. They would do the computations and they'd go and come up with the best answer. Everybody hated it. So after about five years, the testing program got shut down. The fellow who was running it at Los Alamos replaced himself with a guy from the Army's laboratory [U.S. Army Aberdeen Test Center] in Aberdeen [Proving Ground, Maryland], so they needed someplace else for him to go. So they said, "Carl, we're going to give him this fifteen-million-dollars-worth of money that you've been managing and he will now be the program director for that, and you will go do something else." Well, my division leader wasn't happy with that, but again, in an organization like that, you really can't argue about it. So he made me chief scientist for the division, which was a much better title—and frankly, I had no responsibilities at all. [laughter] Two years later, that guy's money was down to less than five million because he really was not a very good manager and he just let it all shrink away.

DAEMMRICH: What does a chief scientist with no responsibilities do with his time?

STORM: Well, a very short time after that I took this job [director of the Gordon Research Conferences]. That made it very easy. [laughter]

THACKRAY: What do you need to do to keep your fifteen million from shrinking to five million dollars?

STORM: Well, that happened to the other guy.

THACKRAY: Yes, I understand that it didn't happen on your watch. So what was the difference in your methods?

STORM: Well, his idea of management was 100 percent top-down. He had projects that he wanted done. My idea of management, on the other hand, was much more like the way this organization [Gordon Research Conferences] functions, which is a bottom-up type of thing. Los Alamos had a wealth of brilliant people. When you sat down to talk with somebody and they said that they could outline some particular area of research that has long-term implications for the nuclear weapons program, and that they could do it very well, my attitude was that you should support it. I also wrote a strategic plan for energetic materials R&D [research and development], which they had never had before. You could work from of that. But, the guy who picked up the program management had come from Aberdeen Proving Ground and he had some very fixed ideas about what was good to do. He would tell people, "Well you're going to go work on this now." Then they would go talk to some other research manager who would say, "Why don't you hijack that money and bring it back over here, and then we'll continue to do this other project."

THACKRAY: So looking back, Carl, what did you learn at Los Alamos?

STORM: One of the things they asked me when they interviewed me for this job was, "Have you ever dealt with prima donnas?" So I said, "Well, I was a program manager at Los Alamos." And they said, "Enough said." [laughter]

Also, there's certainly a difference between big science and little science, if you will, and I'm firmly convinced that individual investigator-initiated research is a very important wellspring for the development of new ideas. Once an area has been reasonably well-defined, when you have a good idea of where you want to go, big science becomes feasible. The Manhattan Project was an excellent example of that. The *physics* of making a fission bomb was pretty well understood by 1940. But *making it*, was, to a large extent, an engineering problem—and a place like Los Alamos was fantastic for that. If you want to create new areas and new knowledge, on the other hand—the bureaucracy of big science is not very kind to individual innovation.

THACKRAY: So you decided you wanted to get out of Los Alamos? That was what happened?

STORM: Well, the Cold War was over and it was really not at all clear what was going to happen to the national labs on the whole. I knew enough about the Gordon conferences, so the idea of working for them was very attractive.

[END OF TAPE, SIDE 1]

THACKRAY: Let's now focus on the GRC [Gordon Research Conferences]. When did you first hear the words 'Gordon conference'?

STORM: I think the first Gordon conference I went to was in 1972. It was the Tetrapyrroles Gordon conference. (4) Since I had done my graduate work on metalloporphyrins, I thought that might be a useful place to go. It turned out the meeting wasn't about anything I was particularly interested in [laughter], so I never went back to another session of it. At that time, they were principally interested in the biosynthesis of porphyrins and the organic chemistry of them. There was little or nothing in heme proteins or metalloporphyrins or the geochemistry of porphyrins or anything like that.

THACKRAY: So how did you get into that conference? Was it just by application?

STORM: Yes. That's the way all the meetings work. To attend them, you have to apply. It's always been like that.

THACKRAY: Why do you think you were accepted?

STORM: Well, that's another, you might say, dirty little secret about Gordon conferences. Most of our meetings are not oversubscribed. There's maybe one meeting every other year where a chair will tell me there's a crank out there that he or she doesn't want at the meeting. Then they want to look at every person that applied even though even though that conference isn't oversubscribed. You know, we get eighteen to nineteen thousand people who come to the Gordon conferences every year now, and for most of them, the application-acceptance process is really a pro forma thing. Conference chairs are not going to turn down somebody who wants to come if there is space. There are a few conferences that are very heavily over-subscribed. They might get 350 applicants. It's very demanding for a chair to pick 140-150 people that will be permitted to come.

THACKRAY: Let's just stay on that topic for a moment and discuss the economics of the conferences. It seems they work best when there are one hundred or more attendees. For how many conferences today is that not true?

STORM: Well, the range of participation will typically go from around 70 to 150 people. Our economic plan is pretty well insulated in several ways. At all of our sites, our contractual agreements are that we pay for the people who sleep there on a per-night basis, and that's it. If there are 70 people at a meeting site, the overhead, of course, isn't as favorable, but we don't incur any particular additional cost. And then we also provide each conference with a chair's fund—this year it's twenty-two thousand dollars. But if a conference draws fewer than 100 people, we scale it down on a percentage basis for the next meeting of that conference. This insulates us from taking a continuing loss on a small conference.

THACKRAY: So the risk is being transferred both to the lodging institution and to the individual conference?

STORM: Yes—people other than me. [laughter]

THACKRAY: Was that true at the start of your work with the Gordon conferences?

STORM: Yes.

THACKRAY: Do you know when that approach was developed?

STORM: Well, all of Alex's [Alexander M. Cruickshank's] arrangements were on a per-night, per-person basis. Every conference that met used to get the full chair's fund. There was a lot of discussion in the board of trustees meetings when I arrived, with people saying "We're losing money on this conference—we've got to get rid of it." My argument was that we should look at the science, not just the bottom line. I was quite willing to protect the economic integrity of the conferences, but I hated to take some meeting that was really excellent, vibrant science and say, you've got to get out of here because you're fifteen people short. So we came up with the scaled chair's fund and the idea that the people who participated in that meeting would share the risk. If they're really keen to do it, and I can give them eighteen thousand dollars rather than twenty-two thousand dollars—that's still not a trivial amount of money. If they're willing to conduct their business and hold it with that level of support from us, and it's great science, then we can work with them. And we have some sites that are friendlier to small groups, so we offer the chairs of smaller conferences alternate locations.

THACKRAY: You said there were conferences with as many as 350 applicants, i.e., they were very popular conferences. Can you enumerate what some of the interesting conferences are today?

STORM: Well, Medicinal Chemistry, I think, had 350 applicants this year. But that meeting has been taking place since 1944 on an annual basis, so it's been of interest for a long time. (5) [laughter] Angiogenesis has drawn some really big numbers. I can give you a listing of all our conferences ranked by number of participants, and maybe by number of applicants. But most of the really large turnouts are for meetings in biology and biotechnology. We started a conference in combinatorial chemistry [Combinatorial Chemistry Conference] a couple years ago, which had a pretty large turnout the first time it met. (6)

DAEMMRICH: Going back to that first conference you attended, you said the topic wasn't quite what you expected. Did you actually leave or did you stay the full week?

STORM: Oh, no. I stayed the whole week. Most people stay the whole week. Attendance forms a sort of a bell-shaped curve. People used to arrive for the meetings on Sunday, and the first sessions were on Monday morning and went through noon on Friday. We found that the Friday morning participation was pretty low. It would be maybe down to about 60 percent or fewer, so we phase-shifted forward, and now we start them on Sunday evenings since people are there anyhow. The meetings finish up Thursday evening and people leave first thing Friday morning. We have about 85 percent participation on Sunday evening. That number will peak on Monday in the nineties, and then it tails back down. On Thursday night it will be back down to around 85 percent of the registered people sitting in the room and participating in discussion.

DAEMMRICH: A lot of people we talk to say they went to a conference and fell in love with GRC. Did you go to later conferences after that initial one?

STORM: Yes. I've gone to probably one a year since about 1972—either every year or every other year. I've been to Metals in Biology every time it met between 1974 and 1986, as well as Organic Geochemistry and a variety of other topics. (7) I gave up going to ACS [American Chemical Society] meetings about that time. I don't think I've been back to one since. I always found the Gordon conferences to be a very friendly place. My wife. would never go to a Gordon conference with me, no matter where it was. She said, "Why should I go there and be ignored for a week while you sit around and talk about things I don't understand with other people?" [laughter] We get very few guests who come to the Gordon conferences—maybe two or three—because the meetings are just very intense and focused.

THACKRAY: These were New England conferences you were going to?

STORM: New England and California. Metals in Biology regularly met in California. This was up at the old site in Santa Barbara [California, Miramar Hotel].

DAEMMRICH: How did you fund your own attendance when you were at Howard?

STORM: Something that I always thoroughly enjoyed about the Gordon conferences was that I could pay for them myself. I went to them many times, particularly the New England conferences, even if I had spent all my money on my students and things like that. I was living in Washington, D.C. then. I would leave Silver Springs, Maryland at about 5:00 am on a Sunday in my car and drive up to New Hampshire and get there about 4:00 pm. I could always afford one hundred fifty or two hundred dollars, whatever the registration fee was there. I certainly was not taking bread out of my children's mouths. I suspect I usually paid for it out of research grants, but if I didn't, the cost was not an obstacle to me personally. I doubt, especially being from Howard, if any chair prior to the one I founded, ever paid my way.

THACKRAY: Why do you say "being from Howard?" You weren't interesting enough to be recognized?

STORM: That's right, yes.

DAEMMRICH: So it's the mid-1970s. You've now begun attending several conferences, either every year or when they're meeting on two-year cycles. When did you first chair a conference?

STORM: Well, I founded the Energetic Materials Conference in 1988. (8)

THACKRAY: Is that a euphemism for explosives?

STORM: Well, it covers everything. High explosives are one particular class, then propellants. There are other things like thermites. There are a lot of different types of metastable materials, if you will, that can go anywhere from bang to fizzle to burn. For example, black powder is an energetic material, but it's rarely a high explosive. Ammonium nitrate is an energetic material.

THACKRAY: Can you talk in some detail, Carl, about setting up a Gordon conference? Who did you work with? What was it like? What problems became apparent?

STORM: Well, when I was at Los Alamos, I worked quite closely with a fellow named Dick Miller at the Office of Naval Research [ONR]. Dick was a very good program manager at ONR. I think he's passed away now. We used to sponsor maybe one or two meetings a year, mostly at Los Alamos, for the energetic materials community. So we jointly sponsored one down at New Mexico Tech [New Mexico Institute of Mining and Technology] and about one hundred invited people came. We talked across a pretty wide range of different aspects of the chemistry and physics of what were mostly high explosives. At the close of the meeting—and this is frequently an entree to a Gordon conference—there was an upwelling of opinion from everybody who was there that we've had a great time and covered some key areas. It had been a weeklong meeting. So we thought, why not see if we can make this into a Gordon conference?

Tom [Thomas B.] Brill from the University of Delaware and I were fingered to do it. So I wrote a proposal and sent it into the Gordon conferences. At the time there was a fellow on the board of trustees [of GRC] who was at the Office of Naval Research]. He was between positions at two different oil companies, so he was quite interested in the field. Though I didn't know him or about his presence on the board, he probably had a lot to do with our conference being accepted. That was probably a fortunate synergism.

THACKRAY: Do you know who that was?

STORM: Robert K. Grasselli, who's at the University of Munich [Munich, Switzerland] now. He had left an oil company out in Ohio [Standard Oil Company (Ohio)] and was doing a stint at ONR before moving on to Mobil [Mobil Research and Development Corporation].

We had our first meeting at the New Hampton School. ([9]) Energetic Materials is still meeting every other year, and is one of the successful conferences from that era.

THACKRAY: So what about the financing of that first conference?

STORM: Well, again, the chair's fund comes from the Gordon conferences. I'd say about half of our meetings do not have any financing beyond the chair's fund that we give them. For Energetic Materials I did get some money—probably from Los Alamos, ONR, and Sandia [National Laboratories]—a few thousand dollars. Most of the people who are involved in that field are from places like [the DOE] national labs and the Department of Defense, so having support for attendance isn't really an issue. The labs, if they'll let them come at all, will pay for it. Actually, at the end of the first Energetic Materials Conference, I was walking around the

halls looking for people who might need some money. [laughter] There was one guy there who had left a job at Princeton [University] and was moving to New Mexico Tech, and had been too bashful to ask for any support. When he found out I was giving him two hundred dollars, he became my friend for life. [laughter]

DAEMMRICH: How did you frame the initial proposal for the conference? What sorts of things go into such a proposal?

STORM: Well, this is quite specifically outlined on the GRC website [http://www.grc.org], but we keep it as simple as possible. Basically, the applicant gives us a mock program, though they do not have to confirm this with a list of speakers when they apply. The proposal would just say, "This is the subject title. These are the nine sessions. These are the people that I would ask. This is what I would ask them to speak about in the best of all possible worlds." For somebody who's thoroughly familiar with the field, it can be done in two hours. Then the applicant gives us their CV [curriculum vitae] solicits a half a dozen letters supporting the proposed conference, and gives us the names of some referees. So the normal proposal, depending on how carried away they get with their CV, might only be six to ten pages long. I advise people to be realistic—if they give us a proposal with eight Nobel Laureates on it, our board might question whether they can actually deliver it for the final program. [laughter] At the same time, you don't want sixteen assistant professors. There's a middle area of well-recognized people—a few people from the National Academy [of Sciences] and places like this—to make it credible. Then we send the proposal out for review.

One thing that we really look for is to be careful not to destroy one Gordon conference by starting a new one. Often we get an unhappy clique who wants to go off and start their own conference because they don't feel they've been sufficiently recognized [laughter] within the conference that is more or less addressing their area of research. I spoke earlier of the Tetrapyrroles Conference. Well, we recently got a proposal from a minority woman in Nebraska to start one on cobalamins—vitamin B-12—and we had also just gotten a proposal from another minority woman in Texas to start one on heme proteins. These would both compete head-on with the Tetrapyrroles Conference that has been around since the early 1970s. (10) But we would be in a hard position if we were not cooperative and let them try it at least once. We look to be flexible about the evolution of fields and disciplines.

THACKRAY: What role does the selection [and scheduling] committee play?

STORM: The selection and scheduling committee and the board of trustees jointly look at applications and decide which conferences they want to start. Then it's up to headquarters—largely Gerri Miceli [program manager for GRC]—to decide where they fit into our schedule.

THACKRAY: Let me caricature it a little and say it almost sounds as if headquarters is just a super-efficient post box.

STORM: Well, I often refer to our function in my talks to the Gordon conferences as the innkeepers. Basically, we're the innkeepers for the organization. We try to keep everything organized and running smoothly. Every conference is self-governing. Each conference elects the future chairs for their meeting and administers its own money. I try to stay out of their business. I don't micromanage. For example, I don't review their programs. I assign them a block of time and a location. The meeting must stay within that block of time. It cannot start at 7:30 in the morning and go to 11:30 at night because I haven't rented the goddamn halls for those times. [laughter] But if what you do within those blocks of time results in excellent ratings from your peers, then it will probably be continued in good form. If it doesn't get good ratings from your peers, then it will probably be discontinued.

THACKRAY: What about new areas of science—areas that *need* a Gordon conference?

STORM: Well, I worked for probably three years to get a conference started in quantum computing, because it seemed this was an area that needed discussion. (11) Quantum computing is not a community that GRC is really well-known in, and it took a terribly long time before I found a woman at Berkeley [University of California, Berkeley] and a man at UC Santa Barbara [University of California, Santa Barbara] who would give us a proposal.

We got a conference started in malaria a couple of years ago. I sent an e-mail to the guy who was the head of NIH then—

THACKRAY: [Harold E.] Varmus?

STORM: Yes. I sent Harold Varmus an e-mail—because they had this meeting in Dakar, [Senegal], and having read about it in *Science*, it sounded likely—asking him if a Gordon conference in this area would be useful. To my utter and total amazement, I got a response from him about two hours later. [laughter] He said, "Yes, good idea," and he gave me the name of one his lieutenants there at the NIH. I talked to that guy and he sent me to a woman up at the Harvard School of Public Health. Three months later, we had a Gordon conference on malaria. [laughter] Suggesting conference topics is a small part of our business, but we're not adverse to targeting opportunity. It's just that we don't do aggressive, top-down management.

THACKRAY: Do some suggestions of this kind come out of the whole, or specifically out of selection and scheduling?

STORM: They can, but someone will more likely go to one of their colleagues and say, "Why don't you send in a proposal like this?" And within the last year, the trustees have decided that they should survey the total inventory, if you will, of our meetings and look for holes. We're in the process of doing some of that now. The council of the Gordon conferences is what you might call the highest-level governing body of the Gordon conferences. So once my board gets this query put together, they'll send that out to the nearly four hundred people on the council to get their suggestions.

THACKRAY: Do you sense any change in the way you think about and seek to stimulate possible conferences, as compared to your predecessors?

STORM: I think it's qualitatively the same. It's clear that I work for a twelve-person board of trustees, and the members of that board will change. For example, a current member is Jim [James A.] Bristol, who is quite high up in the Pfizer**Error! Bookmark not defined.** hierarchy and comes from corporate-America. A couple of years ago he said, "Boy, we don't have a strategic plan." Well, a year later we had strategic plan. It certainly is useful, but I suspect that unless somebody like Jim is around who will take a continuing interest in it, three or four years from now we will be functioning less formally in that regard. As a director, you take more interest in the areas for which board members express interest and concerns.

THACKRAY: Back to the Energetic Materials Conference—you proposed it, you organized it, it gets accepted, and you hold the meeting. Where did it take place?

STORM: The first meeting was held at the New Hampton School up in New Hampshire.

THACKRAY: Was it successful?

STORM: It worked out pretty well. Participation was good. There were people from the national labs, the Department of Defense, universities, and a couple people from industry. And the group still meets. It's been renewed every other year. It was kind of on hiatus in the mid-1990s, you know, once peace broke out and interest in energetic materials dropped. This year there was quite a good turnout, and I think there's more interest in those subjects once again.

THACKRAY: Did you just chair the first meeting, or did you stay on as chair?

STORM: No. You can only chair a Gordon conference once.

DAEMMRICH: Have you chaired other meetings?

STORM: No. People are welcome to chair as many different Gordon conferences as they get elected to. We have people that I'm sure have chaired at least a half-a-dozen. You could chair the same one as long as there was a decent length of time between meetings—I might suggest about ten years. But today, this office would not permit someone to chair the same conference back-to-back.

[END OF TAPE, SIDE 2]

THACKRAY: The council is largely made up of chairs?

STORM: It's made up of all of the chairs of the active conferences, the board of trustees, the selection and scheduling committee, fifteen at-large elected members, and representatives of each of the [sponsoring] companies dating back into the 1930s. Also, anybody who gives us twenty thousand dollars or more in a given year is entitled to have a representative on the council.

THACKRAY: But if the conference chairs keep changing, the council, in fact, is a—

STORM: It's a floating body. We've attempted to address that a little bit. The conferences don't have to send their chairs to the council—a particular meeting can elect a representative. That person can serve multiple [two consecutive] terms, so they can represent a conference for a maximum of four years. We've also added fifteen at-large elected members to the council, in order to have a bit more continuity. Unfortunately, we've had trouble tracking down people that gave us twenty thousand dollars in a given year. Let's say money came from the Merck [Company] Foundation—we would go back to the Merck Foundation and say, "Would you like to have a representative on our council?" And they'd say something like, "Say what? Who?" [laughter] Having those representatives on the council is a very sound idea in theory, but I don't think it would make much difference.

THACKRAY: So in 1988, you found the Energetic Materials Conference and continue to attend. How did you first learn that GRC was looking for a new executive director?

STORM: It was advertised in *Science* magazine. And, actually, the University of California [UC] was having an early retirement program that I was eligible for. The combination of peace breaking out, UC's early retirement program, and the GRC advertising for a new director was fortuitous. I was living in New Mexico, but my wife. and I were from the East Coast anyhow, so the idea of moving to Rhode Island sounded good. I'd been at Los Alamos ten years. I've rarely stayed any place more than ten years in my life, so it made sense.

DAEMMRICH: Who interviewed you? What was the format of the interview, and what kinds of questions were you asked?

STORM: Well, there was an interview committee of about twenty people on it. There were fortuitous things about this interview, like everything in life, I guess. There was a fellow I worked very closely with at Los Alamos, a physicist named John [W.] Shaner. We got along very well. Shaner was a very close friend of a guy at Cornell [University], Neil [W.] Ashcroft, who had chaired both the Gordon conference board of trustees and the interview committee. I think that John talked to Ashcroft and gave me an excellent recommendation for the job.

The interview was in a somewhat large hotel room with a great, long table, and these twenty people were sitting around it. They had a quite a few women on the committee—the conferences have had a long-standing commitment to the integration of women in science. John [I.] Brauman was a member of the interview committee. Since I had known John for some years from Stanford [University], they sent him to bring me in and introduce me to the committee. So John brought me in to the end of the table and said, "This is Carl Storm." And then he turned around and he picked up my tie in his hand and looked at it and said, "You know, Carl, that's the ugliest tie I've ever seen in my life." [laughter] I said, "Thank you very much, John."

DAEMMRICH: So now that they've put you at ease by having twenty people staring at you and insulting your clothing, what did they ask you?

STORM: The only question that really remains very, very clear in my mind was that they wanted to know what experience I had dealing with prima donnas. I said, "Well, I've been a program manager at Los Alamos," and they said, "Enough said." [laughter] Other things they were interested in were my basic philosophy of management and how I would deal with an organization of this size. And another fortuitous thing, if you will, is that because one of my children is handicapped, I have sat on some twenty-five different non-profit boards in the course of his growing up—from sheltered workshops to associations for citizens with mental retardation in Maryland, New Mexico, and other places. So I have a lot of knowledge about audits and bookkeeping and personnel policies, and how you manage ten people, how you hire somebody, how you fire somebody, and how you care for and feed nonprofit boards. If I were a straight, bench-level research scientist, I never would have been exposed to this stuff. I think

the committee found that very attractive. Kathy [Kathleen C.] Taylor was on that committee as well, I'm pretty certain. She pointed out to me that I would be sitting on the other side of the board table and asked if I could deal with that adequately. I was not going to be a board member, and she wanted to know if I understood the difference between working for a board and being a member of a board.

I think they liked the idea that my research experience spanned all the way from protein chemistry to shock physics, so I was not going to present any image that the Gordon conferences should only be on porphyrin chemistry or something. They asked me what I was going to do about the Gordon conferences becoming more oriented toward the biological sciences. I said, "Nothing." [laughter] There really was little choice. That's where the money was. That's where research was going. I mean, you could monitor it and you could follow it, but to arbitrarily say, "We're not going to do that," would probably do a lot of damage to the organization.

They also wanted to know if I was going to move the organization, because there was some interest in that.

DAEMMRICH: You said, "Nothing more than a quarter-of-a-mile"? [laughter]

STORM: Well, I told them I certainly had no agenda in that regard.

DAEMMRICH: Did you have thoughts and plans on how you might make changes at GRC?

STORM: Not really. My approach to most things is to first find out what's actually happening—and it turned out that there were huge challenges. The organization and its administration were still in a paper-and-pencil mode. The first three years I was here, I went to every Gordon conference that met—so I probably went to four hundred Gordon conferences in that time.

THACKRAY: At the peak, how many conferences were meeting simultaneously?

STORM: Twelve or fourteen. I'd drive around New Hampshire and visit every site. During the first two years, my staff would call up to a site and say that I would be by there at 10:30 on Tuesday morning. The chair of the conference would be sitting in a chair next to the door waiting for me with a list of problems. [laughter] A lot of people said that the administration of the conferences was nowhere near the quality of their science reputation, and if that wasn't fixed soon, there was going to be big trouble.

THACKRAY: Are we talking about the mechanics of the coffee not being there, or something more?

STORM: We're talking about getting people admitted, the finances, internal management, and lots of other things. A lot of the issues had to do with a transition between doing things by U.S. mail and using computers. The administration used to move the entire operation for each conference location. The first of June, they would get a U-Haul truck and pack up the entire office at URI [University of Rhode Island] in Kingston, [Rhode Island], drive up to New Hampshire and set it all up at Colby-Sawyer College, run the business for three months, and then put it all back in a truck—Xerox machines and everything—and drive back down here and set it all up in Kingston again. Well, there would be a two-week hiatus while all of this was going on, and then there would be these boxes of mail, *this big* [gesturing], that hadn't even been opened yet. People had applied, and sent in their registrations and checks. They didn't know whether they were going to come to the meeting. So one of the first things my administration decided was that we would bite the bullet and run things year-round out of Kingston—and that was quite an adventure. I would drive to New Hampshire on Sunday morning. I had an office at Colby-Sawyer College. I toured all of the sites and all of the meetings. On Thursday I would drive back down to Kingston, go over to Salve Regina [University] that night, and then work in my Kingston office on Friday and Saturday. On Sunday morning, I'd drive back to New Hampshire again. So I ran that course for three months during the summer. And then I'd go to California and live out there for two-and-a-half months during the winter. I kept busy.

THACKRAY: Moving the office had been going on for forty or fifty years, hadn't it?

STORM: Since 1947.

THACKRAY: That's interesting. How else were the realities different from your expectations?

STORM: Well, I was a little surprised to find out the organization had no money. Alex had a couple of million dollars in CDs [certificates of deposit], but there was no budget. There was no financial plan of any kind. There were no resources. The money in those CDs really belonged to the conferences. Private donations that don't get spent are kept on the books and carried over. There was maybe three million dollars in CDs, and probably two million dollars of that belonged to the organization. The operating budget at that time was about eight or nine million dollars a year—so there was, maybe, one million dollars in cash reserves—which is pretty thin for an operation.

THACKRAY: When you say, there was no budget, what do you mean by that?

STORM: There was no budget. [laughter]

THACKRAY: That's pretty dramatic.

STORM: The auditors from KPMG [LLP] made up a summary of what happened last year. It was pretty simple—GRC paid so much for rooms and so much for meals. The summary was about eight items, which were the major cost expenditures. So we now have a two-page spreadsheet with maybe one hundred lines on it, which break down what our anticipated expenses are. It was pretty hard to tell what was going to happen the following year. The assurance I got from the staff was, "It worked fine last year, it probably will work all right next year." [laughter]

DAEMMRICH: When you first came on to GRC, was there a transition period for Alex Cruickshank, or were you literally handed the keys to the door when you arrived?

STORM: There was no transition period. Alex shook my hand, wished me the best of luck, and left. He's a complete gentleman. He's always been very responsive any time I've ever asked him any questions.

DAEMMRICH: That first year, did you need to call him on the phone once a week?

STORM: No, not really. Darlene [Graveline] and our financial person, Suzanne [Tucker], were both here and they pretty much knew everything that was going on.

THACKRAY: When you arrived, the permanent staff consisted of how many people and in what roles?

STORM: Well, it was pretty much the same as it is now. We had about twelve or thirteen people, and three people who we call 'conference coordinators.' These people interface with the conference chairs, take care of the applications and registrations, help the chairs coordinate the meeting sites and get their programs in, and all of these things. Then we have about five people who work in our financial office, and they take care of all the grant submissions, administer the money on behalf of the chairs, and cut checks for all the travel refunds. They interact with our auditors and take care of all of the credit card charges and this kind of stuff.

Darlene is our office and operations manager. We also have two guys and two consultants who work in our AV [audio-visual] and IT [information technology] departments. Gerri does all the work related to new conferences and the scheduling, and handles interactions with the selection and scheduling committee and the board, and gets all that information organized in one huge package so that the committee can look at it in one day.

THACKRAY: Carl, can you talk about the governance structure, and what it is and how it works?

DAEMMRICH: I know in the past the selection and scheduling committee was divided into biology, chemistry, and physics. Is that still the case? How does that work?

STORM: Well, it's certainly the case in theory. It has become more and more demanding to do that in any meaningful way. A couple of years ago we split both the board and the selection and scheduling committee into three committees, and each of those committees has people from biology, chemistry and physics. Each committee takes a third of the conferences—so that group has to look at maybe fifty-five conferences in a day. There are people on the committee from all three disciplines, so we get an interdisciplinary view of whether or not that particular field is attractive and whether that conference is functioning. We've gotten away from having only the biologists look at biology conferences.

DAEMMRICH: When did you make that change?

STORM: About four years ago. The whole group used to sit down and go through everything. They first broke it up by biology, chemistry and physics, but the numbers of biology conferences kept getting bigger and bigger and bigger.

THACKRAY: So you sliced it the other way?

STORM: Yes.

THACKRAY: So looking at all those conferences is one day out of the year, and each of those three committees has how many people?

STORM: It's about seven people per committee.

THACKRAY: And they are looking at fifty or so conferences. And what exactly are they looking at?

STORM: Well, we give them a package of conference information. One group of conferences is assigned to a primary reviewer and another group of conferences is assigned to a secondary reviewer—so every conference has two reviewers. We give them a packet that has the conference program, the evaluation results from the conferees at the meeting—which is a form that conferees fill out, commenting on the meeting and on the site—and any other supporting correspondence that we have had with the conferees. So the packet might be ten pages.

THACKRAY: Is there a chair's report?

STORM: Typically that report is a fill-in-the-blank form, but if the chair has any further concerns, they're welcome to write. We also assign a monitor if a conference is having any problems—so then there would be an independent referee's monitor report.

THACKRAY: But only if there are problems?

STORM: Yes.

THACKRAY: How many of the conferences would have a monitor?

STORM: I think there were about sixty last year. I think the board had some concerns about their operation.

THACKRAY: And how many conferences are scheduled for extinction or dramatic surgery as a result?

STORM: Well, if a problem arises with a conference, the first thing the board will do is put the meeting on probation. If the conference hasn't clearly solved the problem the next time they're up, then it's eligible to be terminated, to be discontinued. I'd say that typically we have six to ten terminations a year—although as Gerri pointed out at lunch, last year they only ended four. I said the board would have to do better than that this year if they want to admit many new conferences.

THACKRAY: What sort of thing would lead to being put on probation?

STORM: Well, this evaluation form that the conferees fill out is probably the most important factor. The form has a section on science and a section on discussion. If the evaluations for new, cutting-edge science are not good—if the conferees don't say, "Everything that was presented was unpublished and new," then that meeting becomes a target. And, if the meeting hasn't allowed sufficient time for real discussion, conferees complain about that very quickly. So if a meeting gets low science scores or low discussion scores, probation would be considered. Now, the problem is, even our worst conferences rarely get, say, less than a B-minus. What we do is take maybe the bottom 10 percent and say, we're going to look at those conferences. The people that we deal with are very clever, so we get lots of arguments about why we're not doing it right. [laughter] If the numbers fall below one hundred people, we have to ask, "Is this a topic that's coming up or is it something that's going down?"

THACKRAY: Is this the territory that causes you the most ulcers, Carl?

STORM: Killing conferences doesn't bother me at all. [laughter] There's a large segment of people that we deal with who are absolutely convinced that for any situation they encounter in their life, they can think of a better way to do it. And to a large extent, they're right. They are very clever people, and there are lots of ways that you can run this business. I tell them that, we've chosen this way, and if you're willing to run it this way, we can both have very easy lives. If you want to try to run it some other way, then neither one of us will have a very easy life. We have a very straightforward, franchise format, if you will. If you're managing a McDonald's restaurant, and you decide you want to increase the amount of meat in your Big Mac by 20 percent, you're going to have a very hard time doing it, and you're going to lose your franchise. To run a sixteen million dollar-a-year business, deal with nineteen thousand conferees, run 165 meetings with fourteen people—we're doing about one hundred fifty thousand dollars a year of business per employee. And believe me, if DuPont could do that, they would think they had died and gone to heaven.

DAEMMRICH: Under governance, what is the relationship with AAAS [American Association for the Advancement of Science], and how has that changed in the time you've directed GRC?

STORM: Well, the director of AAAS is an ex-officio member of our board. Rich [Richard S.] Nicholson was a very active member. We have not seen anything of Alan I. [Leshner] yet, but I see him when I go to Washington and he is very supportive of us, and I hope he will begin to show up at our meetings. Rich was extremely helpful to me because he had been running a business like GRC. Add to that his experience at the NSF [National Science Foundation], and he was very supportive. *Science* has been our journal of record, going back to the 1930s. I have

a very good relationship with Beth Rosner and we work well together. We use probably about thirty pages a year in *Science*, advertising the business in different ways. A few years ago, one of the questions we asked in our evaluation was, "How did you hear about the Gordon conferences?" About 20 to 23 percent of people cited *Science*. That's probably down to about 6 percent now.

THACKRAY: Why is that?

STORM: That's a very good question. It's probably a measure of the effectiveness of print journalism. People come to our website to learn about the conferences. But asking people how they heard about the conferences produces reactive responses—it's a little hard to tell whether we're getting accurate answers. The principal method of hearing about a Gordon conference is from the chair. The next is from a colleague. Those numbers have always been pretty high. *Science* has really taken the swoon, but I don't think we'll ever stop advertising in *Science*. We pay them seventy thousand dollars a year for our interaction, which, Beth assures me, is heavily discounted. She usually tells me that over a nice lunch at a Washington restaurant. [laughter] I would like GRC to be more tightly linked with *Science*'s website. I think if we began to trade more website access or something, it would be beneficial marketing.

THACKRAY: A huge weight hinges on the caliber of the board. Is maintaining that caliber a self-sustaining, benign process?

STORM: Well, it's self-sustaining. The board has a nominating committee. The basic requirement to serve on the board is to have chaired a Gordon conference—or have served on the council. But most people who are on the council are there because they've chaired a Gordon conference, so it's a little bit cyclic. But you can be on the council without having chaired a Gordon conference.

The election is conducted by the council. The board, at least in my experience, has been very conscientious about looking for people who are both good scientists and conscientious administrators—conscientious about maintaining the health of the organization. As a result of the election that we just completed, we will have a majority of female board members come October. I don't know, we may be the first major scientific organization to be run by women. Their first task may be to fire me. [laughter]

[END OF TAPE, SIDE 3]

THACKRAY: And the board meets twice a year?

STORM: Yes, twice a year.

THACKRAY: For how long?

STORM: Well, the board meets for one day. In the fall, the board meeting is coupled with a one-day S&S [selection and scheduling committee] meeting. In the spring it's coupled with a finance committee meeting, which is about a half a day. This is a pretty dramatic change—when I came to GRC, the board meetings were three days long.

THACKRAY: What was the board doing for three days?

STORM: That's what some of the members said, actually. [laughter] They got no information about the board meeting prior to showing up, and they walked in to find a stack of paper about *this high* [gesturing]. They would start at the top and start going through it. They would argue about things and then they would go back and change their minds, and then they'd ask, "Can we vote on this?" And it just went on and on. So our board meetings now take about six hours, and the members are well-informed during the year and they have a lot of information before the meeting. At the end of his second meeting, after I had become director, John Brauman got up and said, "Well, you guys can all pack your bags and go home. I figure about three more years and Carl won't need you anymore." [laughter] John was always supportive.

THACKRAY: In those six hours twice a year, what are the key things that the board does?

STORM: Well, we have several committees that report on the results of selection and scheduling, and on our finances. I give a report on our operations that usually takes about an hour and a half. We have old business, and new business—for example, we'll be discussing the Chemical Heritage Foundation [laughter]. I can give you one of our board books and you can look and see what was discussed. That's probably the best way to summarize the answer to your question. But it's pretty garden variety—it's the business of the organization for the last six months. I don't know whether it's good or bad, but we don't do anything radically different unless it's on an incremental basis. We don't, by and large, have any huge new ventures. For example, over the course of three years, we discussed constructing a building, but we talked about it at each session. Usually we have to agree to one piece of something like that before continuing down the path.

THACKRAY: Well, the decisions to have conferences in California and abroad weren't exactly incremental.

STORM: Well, the California move was in 1963. That was at the invitation of a California constituency—in particular, the electrochemistry mafia at Caltech [California Institute of Technology]. Some of the people who were instrumental in that—they insisted on it by pushing the board—are still going to the Electrochemistry Conference in California.

And the international business got started in 1990. Alex was not at all keen on that. That was a board initiative. Bob [Robert K.] Grasselli and Leila Diamond had connections to Ettore Bergamini at the University of Pisa, and Jim [James R.] Florini, knew her. They really gemmed it up, and just kind of went and did it.[12] One board faction thought it was going to be the death of the Gordon conferences, because there were no financial reserves. They thought they were going to go over there and run up some huge bills and bankrupt the organization. I think the board vote on whether or not to do it was about a six-six split.

THACKRAY: That was only about ten years ago. And now there are how many overseas conferences and locations?

STORM: This year we ran about twenty-five conferences in four locations—Oxford [England], Italy, Japan, and China. We must have about sixty conferences in our total inventory that are on a rotation.

THACKRAY: Rotation between the U.S. and overseas?

STORM: Yes. We don't *run* overseas conferences per se. Virtually all of the meetings are scheduled to rotate internationally.

THACKRAY: Are the rotating conferences typically new or old?

STORM: Well, the tricks is, really, if you look at a conference and it has a non-U.S. enrollment of greater than 35 percent, you can expect a request to have the conference overseas. The European participants will say, "Why do we always have to travel? Why don't you come to Europe next time?" And then the enrollment will usually flip, to become maybe 40 percent U.S., 60 percent European. Most of the rotations come about that way. Many of the new conference proposals come in with a specific caveat that an international rotation is expected. Some ask to have their first meeting overseas, although I'm a little reluctant to allow that because their eyes are often bigger than the reality. It's nice to make sure it's going to work here before we send it off to the rest of the world.

DAEMMRICH: When you first came on as director in 1993 and really made a push to attend pretty much every conference that year, did you notice a difference between the conferences in New Hampshire, Europe, and California?

STORM: Well, I think a hallmark of the business is that a meeting should look like a Gordon conference no matter where it is. That is one of my struggles. As people go off to different places in the world, they want to do something different. I try to emphasize to them that the Gordon conferences have a brand image. I want somebody to be able to show up anywhere in the world to find the timing of the meeting and the quality of the site more or less the same, and to feel like they're at a Gordon conference. If that can't be achieved, then I will look for another site. And one of my charges, clearly, was to make the international business work. When I was hired, that's one of the things that the board was quite clear about. They wanted it fully functional and run as an integral part of the Gordon conferences.

DAEMMRICH: What was the motivation for that—simply, science as a global enterprise?

STORM: I think that pretty much summarizes it entirely. [laughter] It was motivated by the idea that U.S. scientists should have the opportunity to globally expose their fields. And there really is nothing else in the world like the Gordon conferences—it's astonishing. The European Science Foundation [ESF] tries to replicate the GRC—but really, they have a totally different business.

DAEMMRICH: Well, you're not a National Science Foundation. What about the European Science Foundation?

STORM: Well, the European Science Foundation is a private organization, and their clientele want them to run [the European Research Conferences [EURESCO]] like the Gordon conference. I have met with very senior people in Europe who've said, "Is there any way we can form a cabal with you, so that we can make ESF do it?" And they have something like the council, you know, and they've done studies and they've issued reports that have essentially said, "Why can't you be like the Gordon conference." And the staff has said, "Because we're not going to do it." [laughter]

THACKRAY: In that regard, what competition does Keystone [Symposia] present to the Gordon brand and model?

STORM: Well, there certainly are similar businesses. Keystone runs a different business. It's on a totally different economic scale. It's management style is top-down. It's focused on skiing. [laughter] It's just like FASEB [Federation of American Societies for Experimental Biology]. Actually, Alex went to Bethesda [Maryland], sat with the people at FASEB, gave them all of our operating documents, and said, "This is how you run conferences." And he had no intention of getting into the business of running Gordon conferences in biology. He said, "You are the Federation of American Societies for Experimental Biology. If you want to run conferences, great. Go run schools in Vermont. This is how you do it." I went down to see them in 1993, and they were still running their conferences on a seven thousand dollar-a-year chair's fund—which is the same amount that Alex had told them to give in 1981. [laughter] They hadn't had the initiative to change it. And because FASEB is run top-down, it doesn't have the same culture as the Gordon conferences by a long shot.

The [United] Engineering Foundation was also a direct spin-off from the GRC, but they adopted a methodology of putting the operations directly in the hands of their chair and an allied board member. So they very quickly wound up meeting in Davos [Switzerland] and Hawaii and Peking [China], and their cost basis is four-times what ours is. It's hugely expensive, unfortunately. And they're now trying to spin their business off. I got a letter from them last year, asking if I would take it. It's just like asking the question, "Is McDonald's a competitor with Applebee's?" Well, they both serve food, but they have a different clientele.

THACKRAY: The economics of the international conferences must be different from the U.S. conferences in some way.

STORM: Well, I charge $125 a person to run the business—my overhead, if you will. I charge $170 a person to fund the chair's fund. The balance of the conference fee is the actual residential cost at the site. I run them all the same way. I also keep a detailed cost analysis of every site, so we can see what the differences in the operating costs are for each site—but they usually level out. For example, in New Hampshire, we usually hire at least four full-time people to staff the conferences. At the hotels in California, we usually will only have two people, because the hotels are well-staffed and have front desks—but I still have to fly people out there from the East Coast—so it all kind of washes out.

DAEMMRICH: I want to pose a few questions in the area of industry versus academic representation, because a lot of the people we've talked to so far are very excited about this issue. Dating back before your time at GRC, there's been a transition. What's the current status? What does the board think about it? Where is the organization headed?

STORM: Well, when the conferences were started in the early 1930s, they were driven by industry. Part of the philosophy of the conferences was that the major national research labs—places like DuPont, GE [General Electric Company], Westinghouse [Westinghouse Electric

Company], as well as government agencies like the National Bureau of Standards[13]—wanted to get together with academic scientists and teach them something about the values of doing basic research. They wanted to get academics involved in research and develop partnerships. But research interests have now undergone a complete inversion. I find it personally disappointing that, today, major industry doesn't seem to see the need for long-term, fundamental basic research. But if major industry can get its research material from universities—which of course comes at a reasonable price—and if that's the way the market is driving things, and if the research can become products that suit industry, then industry has to ask, why swim upstream? And I think participation in the conferences reflects that trend. Our board talks constantly about making sure we're not being hostile to industry and that we solicit their participation. We also rank all of our conferences by industrial participation, and it ranges from 90 percent industry participation to zero.

THACKRAY: Where do you get 90 percent?

STORM: The Medicinal Chemistry Conference, for instance, I think probably has at least 90 percent.

THACKRAY: And which meetings have little or no industry participation?

STORM: Well, I'd say, of one hundred sixty-five meetings we run every year, probably fifty or sixty of the conferences have more than 10 percent industry participation.

THACKRAY: Only fifty or sixty?

STORM: Yes. And then the other hundred-or-so meetings have anywhere from 10 percent to zero industry participation. Keep in mind that participants' involvement in industry is self-declared.

THACKRAY: Do you tabulate other participant categories besides academics, government, and industry?

STORM: We also ask about involvement with private foundations—so we ask participants to provide up to four affiliations.

THACKRAY: Was that sort of tabulation being done before your time?

STORM: These sorts of records have always been kept. We revised the forms that ask for participant affiliations. We also just did a major revision on our evaluation form that we'll start using January first—and I've tried to keep continuity so that we don't completely lose or destroy something in that process. And again, the data from these forms is all self-declared. If you ask somebody from Los Alamos what their affiliation is, they might check 'industry', because they don't necessarily regard themselves as a government lab. Or, if a person works for the University of California, they might check 'academics.' [laughter]

THACKRAY: So is there a problem in this territory, or not?

STORM: I don't think it's a real problem—as long as we make sure that people in the general community are aware of the product that we have to offer.

I give three training sessions a year for chairs. When I talk to the chairs, I tell them that when the board evaluates their conferences, one of the criterions is diversity—so the meetings need diversity in every possible sense. For there to be no industry people meeting on a topic in an area with an active industry is a negative point for that conference. But if a conference deals with multiple areas of the biological sciences, for example, there just isn't any direct industrial interest—so industry participation isn't an issue. The same goes for, say, physical organic chemistry—there's just nobody left in industry who's interested in carbocations.

DAEMMRICH: So you run training sessions for the chairs? Do they come here for those sessions?

STORM: No. I run one at LAX [Los Angeles International Airport], usually at the end of January. I run one up here in Boston, usually the first week of March, and one in May, typically at London Heathrow [Airport].

DAEMMRICH: Is every new chair required to attend?

STORM: No. We invite all the new chairs and pay their way, but I can't go out and kidnap them. We will usually get, I'd say, about 140 people between three sessions. They're usually happy. I'm frequently told, "I came because I felt I had to, and I thought this was going to be the most God-awful, bureaucratic thing I ever sat through in my life. And it wasn't bad." [laughter]

DAEMMRICH: Other than that diversity must be ensured at the meetings, what else do you teach the chairs?

STORM: Well, we have a booklet that's entitled "Advice to Chairs," and copies of the viewgraphs from the sessions, which I would be happy to give you. But basically, we explain the governance of the organization and how it's maintained. We explain the business operation, and the schedule of the meeting through the week. We also explain the division of responsibilities—that I'm the innkeeper and the conferees are the scientists. I tell them, "I don't screw around with your science, and I appreciate it if you don't screw around with my bed-and-breakfast. [laughter] If we can do it that way, it will be really easy. If you want to take on the responsibility of running the business side of it, it will become very difficult."

THACKRAY: If you have 170 conferences going this year, will someone from the staff be at every conference?

STORM: Well, we've attempted to make the monitoring process more efficient. For example, there's a faculty member at Holderness School in [Plymouth,] New Hampshire who had been a good site manager for a number of years. Well, he now tours New Hampshire. He meets with every chair in New England every week, and he has a set number of interview questions. Then he sends us a written report on each one of these interviews—that way we get some direct feedback from the chairs. Usually either Darlene, Gerri, or I will be in different parts of the world at different times. We also run focus groups using another set interview. We pick up to ten conferences a year, and for each one we ask the chair to get three to six people together who have had considerable GRC experience—maybe they've chaired that conference. Gerri has been running most of those focus groups in the past couple of years. The interviews are about two hours long, and we ask questions like: "How do you feel you're treated by the GRC organization?" "Where do you see GRC brand relative to the rest of the world?" "Who do you think our competitors are?" "What do we do worst?" "What do we do best?" The interviews are pretty much the same. It doesn't make any difference whether we're interviewing a physics conference or a biotechnology conference.

THACKRAY: Is that something you instituted?

STORM: Yes.

THACKRAY: You mentioned the Gordon-Kenan Summer Schools. Can you tell us where those came from?

STORM: Well, Ruben [G.] Carbonell is the director [of the Kenan Institute for Engineering, Technology, and Science]. Do you know the Kenan family at all?

THACKRAY: No, but I know the name.

STORM: Yes, well they're quite a wealthy group and they have a big foundation in North Carolina. One of their operations is the Kenan Institute for Engineering, Technology, and Science at North Carolina State University [NCSU]. Ruben Carbonell is a Cuban émigré who is a professor and [was] the director of chemical engineering at NCSU. The NCSU board wanted him to institute science and technology meetings as part of his program. So they talked about it and decided that if they were going to do it, the meetings should be run like the Gordon conferences. Naturally, the next question was, "Well, if we're going to run meetings like the Gordon conferences, why don't we talk to the Gordon conferences about it?" So we had some discussions with Carbonell and NCSU, and their first proposal was that they would co-brand with us for specific meetings that they chose to support. My board said, "No. Absolutely not. We are not going to corrupt the Gordon conference brand." And, of course, Harry Gray was very involved with this. [laughter]

So we had some further discussions, and we came up with the idea of the Gordon-Kenan Summer Schools, which NSCU was very keen on. The programs are about developing technology and they are oriented towards young people. They also support something else that we do called the [Gordon-Kenan] Graduate Research Seminars—which came out of the Metals in Biology Gordon Conference, which is heavily over-subscribed. The summer schools don't admit any graduate students—which has a very negative connotation—so I started a two-and-a-half-day trailer, called the Graduate Research Seminars in Bioinorganic Chemistry. The seminars are organized and run by graduate students who come in on Thursday and spend Thursday evening with the Gordon conference. Then on Friday, Saturday and Sunday, they run their own meetings. Usually twelve or fifteen senior people from the Metals in Biology Conference stay over and act as mentors and discussion leaders.

THACKRAY: So how many graduate students typically come?

STORM: Eighty to one hundred.

THACKRAY: From all around the country?

STORM: From all over the world.

THACKRAY: Is it competitive, or do you, in fact, get eighty to one hundred applicants?

STORM: It has never been over-subscribed.

THACKRAY: And that's just for Metals in Biology?

STORM: No other conference has developed a graduate research seminar. I really thought that might happen, because there are other meetings that could benefit from a graduate seminar.

THACKRAY: Did you just say that only Metals in Biology wouldn't have graduate students in attendance, or is that usually the case?

STORM: Well, when the meetings become heavily over-subscribed, there are choices that have to be made about who will be accepted. Let's say, a full professor and a third-year graduate student, both from MIT [Massachusetts Institute of Technology], have applied to a meeting. [laughter] Now which one gets admitted?

DAEMMRICH: Alex Cruickshank took the approach that people should come to GRC for an exchange, not as students, so he really kind of discouraged graduate student participation. It seems that you've been a little more flexible, and said to the chairs, "If the room is available and smart people are applying, we should let them in."

STORM: Well, it's very much the opinion of my board that a conference that does not have graduate students in it is making a mistake. It's wise, from both networking and professional development standpoints for the students, and from an experiential point of view of the more senior people. And again, diversity is the word that the board really bears on—male/female, minority/majority, junior/senior, industry/academic/government lab—any aspect of diversity that you can think of. And I agree with them—I have no argument with them at all. I've had dinner with many graduate students and post-docs who just beam with excitement about the conferences and say things like, "That's the time I met so-and-so. I never thought I would meet that person."

THACKRAY: Those graduate research seminars have been running for how long now?

STORM: I started that in 1996.

THACKRAY: And how long have the Gordon-Kenan Summer Schools been going on?

STORM: We just had the second chemical physics program [Chemical Physics Summer School] this summer. The first one met in June 2000—so we started the plan about two years ago. And the response to that program has been a little disappointing. I really thought more people would step up and express interest.

[END OF TAPE, SIDE 4]

THACKRAY: Gordon-Kenan is advertised on the website?

STORM: Yes, and in *Science.*

THACKRAY: There seems to be a pattern of slow growth since the 1930s. Do you see any problems in that?

STORM: Well, the board has authorized us to run up to 200 meetings a year. We'll run 175 next year, and so far the board has taken what I'd call a watchful, waiting stance. But as long as we continue to get feedback, and as long as our customers say that they really like what's happening, I think we're doing well. Operationally, we're a hugely different business than we were ten years ago. Alex, for example, went to every conference and he shook the hand of every chair and knew a lot of those people. They were close friends.

THACKRAY: And he was physically ejected by at least one. [laughter]

STORM: Alex and Harry are very good friends these days. [laughter] I was at that conference when that happened. [laughter]

THACKRAY: That's when you said you wanted to be the director? [laughter]

STORM: But one of the problems we have is finding suitable sites. I could run one hundred conferences a year in Ventura, California, but the market demand doesn't seem to be there. We run about thirty-five a year there, and everybody that wants to go there is there. Perhaps that's because those meetings are during the winter and the timing interferes with the academic year.

We seemed to have tapped out the New Hampshire school situation. I just don't know of any additional places up there that are available and suitable.

THACKRAY: Is there any reason you shouldn't go to small colleges or sites in places like the Midwest?

STORM: Gerri and I were down in Raleigh [North Carolina] last week and visited North Carolina State University, which is not exactly a small college. Several years ago, Alan [H.] Cowley and I visited a small college in Virginia not far from there, and that time the board said, "It's too hot in the summer." They didn't want people to go down there in July and have to stay inside. It's hot as hell in some of those places. Right now the conferences are in Maine, New Hampshire, Connecticut, Massachusetts, and Rhode Island.

THACKRAY: So 'New Hampshire' is a euphemism.

STORM: Right. Really we should say that GRC is in New England. This year we started meetings at Colby [College, Waterville, Maine] and Bates [College, Lewiston, Maine]. Things are promising up that way. We may wind up with thirty or forty meetings in a cluster around that part of Maine. The meetings this summer seemed to work pretty well up there. There are also small colleges up there that we can use.

THACKRAY: Where are the Oxford meetings held?

STORM: Queen's College [Oxford, England] .

THACKRAY: There are about twenty other colleges available in that area.

STORM: Yes. My connection with Queen's was from when I did a sabbatical at Oxford from 1974 to 1975. That's kind of how GRC wound up there. It was my hope that I could turn Oxford into the New Hampshire of Europe. I toured all over Oxford and I didn't get a nibble from anybody else, but Gerri was over there this summer and got a very good response from Worcester [College]. I had talked several years ago with Magdalen [College], and I got an e-mail from them just a couple of weeks ago, actually. They said, "Hey, you know, we don't have any summer business now. Are you sure you guys wouldn't be interested in bringing GRC here?" Gerri's going to Oxford in about two weeks, so we may have more expansion space there than I had thought. But a lot of our clientele feel that the U.K. is not Europe.

THACKRAY: [laughter] We won't discuss that.

STORM: That's right. But there are people who want us on the mainland. France and Italy are the most likely places, and we do have a site in Switzerland that we use periodically.

DAEMMRICH: What has stopped you from just building your own facility—one facility that can host three conferences at once, fifty weeks a year?

STORM: Well, I've thought about that a good deal, and I think in the long-term that could well be how things will wind up. Ten years ago we had no assets at all. Right now we have twelve million dollars in liquid assets in the bank.

THACKRAY: That's a fairly healthy rate of appreciation.

STORM: And if the goddamn stock market hadn't dumped all over us, it would be a lot more than that. I think quite possibly that having an Asilomar [Conference Grounds]-type place on the West Coast and a similar place on the East Coast could well be the way to go. But when I came here in 1993, I spent a lot of time the first year assessing how this organization was doing and where it should be going. Then I invited all of the past board chairs to a one-day session. The university [of Rhode Island] has another campus west of I-95 [Interstate 95], and we met out there. They have a meeting center out there. And Fred [Basolo] sat in the front row with his hands on top of his cane, and when I got done talking he said, "All right, Carl, you tell me how much this is all going to cost." [laughter]

THACKRAY: I guess you were outlining some of these ideas?

STORM: Yes. I was outlining changes in operations we needed to make and what the opportunities for growth were. One question I posed was, "We have a very well-recognized brand name—should we do any fundraising?" They said, "No. Don't divert your attention. Run the business." But I think the board is now at a point where they would consider doing some major fundraising with institutions. And if we were going to build, I would build a double-site, not a triple-site. This building [GRC headquarters] cost a million-and-a-half dollars. To build two, first-class lecture halls, Motel-6-type dormitories, and dining facilities for a double-site, we'd probably be talking about a thirty-million-dollar construction project. And we could probably bite that off sooner or later. The Centennial Campus at North Carolina State [University] might not be a bad place to build something like that, because it's located on one thousand acres right next to Research Triangle [Park, NC]. Very upscale businesses are moving

in there. We could maybe even get a building financed with some combination of research grants and other contributions.

THACKRAY: Yes, that's interesting. Over time, the center of gravity has moved from chemistry towards biology. If you survey the world out there, where would the social sciences fit in?

STORM: Well, I would rephrase your statement a little bit—I think over time the center of biology has moved to chemistry.

THACKRAY: [laughter] I won't argue with that.

STORM: But the definition of the Gordon conferences is the same. In the 1930s, it was called the Chemical Research Conferences—but what we do now is really atomic and molecular science. That is the common thread through all disciplines, from geophysics to neurochemistry. If somebody comes to us and says they want to look at the atomic and molecular basis of 'fill in the blank,' then it will work as a Gordon conference. I think other organizations would do well to use this type of methodology, and I would be delighted to coach them. In fact, that was the theme of my visit to Tokyo [Japan] a couple of weeks ago. I visited with JSPS [Japan Society for the Promotion of Science], RIKEN [The Institute of Physical and Chemical Research],[14] and other people. If Japan started an organization similar to the Gordon Research Conferences, I would be very happy to coach them and to interact with them. But they then had meetings that needed international exposure and back and forth—not me running a worldwide organization with fourteen people. I had a very good friend for several years who was Dean of the College of Arts and Sciences at American University. She was a [Mary] Shelley scholar. And I tried to encourage her by saying, "You people don't have any money, right?" [laughter] And she would smack me when I said things like that. I would think that doing things in an economical way would be very useful, but I just could never really get any response to that.

THACKRAY: I have a different question, Carl. From your own experience and from what you've heard, can you talk about what I'll call, 'flagship conferences' and 'seminal moments'? I'm referring to those particular conferences that are very robust and central to their respective fields—like Metals in Biology, for example—and the tradition of new developments that have come out of the Gordon Research Conferences. Can you just talk to those two issues?

STORM: Well, the Natural Products Conference can be traced back to the 1950s and Carl Djerassi and other people. (15) At that time it was really focused on steroid-type substances. And it has remained an incredibly healthy conference that deals with heterocyclic, inorganic, and organometallic chemistry, and organic reactions and processes. The Enzymes and

Cofactors Conference actually goes back to the 1930s, when it was called Vitamins. (16) That conference has had a self-sustaining constituency that was able to regularly reinvent itself and keep the graduate students coming. They learned about it in graduate school and came to the meeting. As they moved into new but related areas, they took what they learned from the conference with them.
So, fortunately, we have a nice core group of meetings that perform very reliably and have very dedicated constituencies that go with them. Those meetings are up at Kimball Union [Academy] or Colby-Sawyer [College] or Proctor Academy, and if you tried to move them out of there, there would be a revolution and you would be lynched. [laughter] Those constituencies seem to be very happy, and their meetings are internally self-administered—so they develop their own conventions and traditions. And as long as they don't turn out to be hugely contrary to the way that we run the business, then that's all right.

THACKRAY: In an earlier conversation you mentioned Dudley [R.] Herschbach and molecular beams as one example of an innovation with a strong Gordon connection. Can you point to others that you've been told about?

STORM: Well, innovations that have something to do with GRC are things I would really like to know more about through this Gordon Research Conferences history project. I think they're one of the most important things we could explore. I've been told anecdotally from time to time about particular innovations, and I guess I should have dashed off and written them down immediately. [laughter] People put a great deal of value on important things being announced for the first time at a Gordon conference. People choose GRC as their venue to tell their colleagues about something for the first time. But I am really more interested in things that came up from grass roots and were created out of interactions at the Gordon conferences. For example, there used to be a meeting called, 'Nucleic Acids and Proteins,' which has since split up. It met at the New Hampton School in the 1950s. (17) I was told that there were regular discussions at that meeting as to what the genetic code was, and that when Marshall [W.] Nirenberg first figured it out, that meeting is where he made his initial report. I believe he was a regular participant in that meeting. His strategy, and how appropriate it was, could well have come out of those discussions.

THACKRAY: I'm asking the question because any innovations that were undertaken would have been written down. And that's obviously something that we would look to.

STORM: But there is an issue as to how to capture that information, which is part of the question you're asking. We've created a place on our website to encourage people to come *just* to address that question.

THACKRAY: All right. Carl, is there anything else you'd like to say at this moment for the record?

STORM: Well, as far as the oral history goes, I think you've probably found out more than I know about the Gordon conferences. [laughter]

[END OF TAPE, SIDE 5]

[END OF INTERVIEW]

NOTES

1. The University of Trondheim became the Norwegian University of Science and Technology (Norges Teknisk Naturvitenskapelig Universitet [NTNU]) in 1996. Retrieved February 19, 2004 from http://sgroup.be/news/news8/n89btro.htm.

2. Research published during Storm's NIH-funded predoctoral fellowship (1962-65) includes: A. MacCragh, C.B. Storm, and W.S. Koski, "Solvent and Substituent Effects on the Spin Resonance Spectra of Metalloporphyrins," Journal of the American Chemical Society 87, no. 7 (April 5, 1965): 1470-76. A.H. Corwin, A.B. Chivvis, and Storm, "The Structure of Acetonepyrrole," *Journal of Organic Chemistry* 29, no. 12 (December 1964): 3702-3. Storm and Corwin, "Proton Magnetic Resonance Evidence for Ligand-Porphyrin Interaction in Magnesium Porphyrins," *Journal of Organic Chemistry* 29, no. 12 (December 1964), 3700. G. Donnay and C.B. Storm, "Tetraphenylporphin and Silver Tetraphenylporphyrin Solid Solutions," *Carnegie Institute of Washington*, no. 64 (1964) 212-15. Storm, "Magnesium Porphyrin Complexes," PhD diss (1965), Johns Hopkins University, 1966.

3. Research published during Storm's NIH-funded postdoctoral fellowship (1965-66) includes: Storm, Corwin, R.R. Arellano, M. Martz, and R. Weintraub, "Stability constants of magnesium porphyrin-pyridine complexes. Solvent and substituent effects.," *Journal of the American Chemical Society* 88, no. 11 (June 5, 1966): 2525-32.

4. Chemistry and Biology of Tetrapyrroles first met in 1972. Chemistry and Biology of Tetrapyrroles 1972 attendance list, Series IV, 67/13, Gordon Research Conferences Archive, Chemical Heritage Foundation, Philadelphia, PA. "Gordon Research Conferences," *Science* 175, no. 4026 (March 10, 1972).

5. Medicinal Chemistry first met in 1944, and had approximately 40 participants. Medicinal Chemistry attendance list, Series III, 14/1a, Gordon Research Conferences Archive, Chemical Heritage Foundation, Philadelphia, PA.

6. Combinatorial Chemistry first met in 1999. Retrieved February 16, 2004 from http://www.grc.org.

7. Metals and Metal Binding in Biology first met in 1973. Geochemistry first met in 1972 and 1973, and became Organic Geochemistry in 1974. "Gordon Research Conferences," *Science* 175, no. 4026 (March 10, 1971), 183, no. 179, nos. 4026 (March 10, 1972, March 9, 1973, March 8, 1974).

8. The first Chemistry of Energetic Materials Conference met in 1988. "Gordon Research Conferences," *Science* 239, no. 4844 (March 4, 1988).

9. New Hampton School in New Hampton, New Hampshire was chosen as the second GRC meeting site in 1950 and was used until 1996. Chemical Heritage Foundation oral history file #0261.

10. See note 4.

11. Quantum Information Science met in March 2003, February 2004, and is scheduled to meet in February 2005. Retrieved February 16, 2004 from http://www.grc.org.

12. The first two conferences to meet outside the U.S. were Complex Fluids (10-14 September 1990) and Molecular and Ionic Clusters (3-7 September 1990). Both met in Volterra, Italy. "Gordon Research Conferences," *Science* 247, no. 4946 (March 2, 1990).

13. In 1988, the National Bureau of Standards became the National Institute of Standards and Technology. Retrieved January 27, 2004 from http://www.nist.gov/.

13. Since this interview was conducted, RIKEN has been dissolved as a public corporation (September 2003) and is now an independent administrative institution under the Japanese Ministry of Education, Culture, Sports, Science, and Technology. Retrieved January 26, 2004 from http://www.riken.jp/engn/r-world/riken/outline/.

14. Steroid Chemistry Conferences were chaired by T.F. Gallagher in 1951 and Carl Djerassi in 1952, and a Chemistry of Steroids and Related Natural Products Conference was chaired by Djerassi in 1953. Chemical Heritage Foundation oral history file #0261.

15. The first Vitamin Conferences were held in 1935 and 1939. Chemical Heritage Foundation oral history file #0261.

16. Physical Methods in Nucleic Acids and Protein Research Conference met in 1950, and Nucleic Acids and Proteins Conference met in 1951. The Proteins and Nucleic Acids Conference met again in 1954 and continuously during the 1950s. Chemical Heritage Foundation oral history file #0261.

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