CHEMICAL HERITAGE FOUNDATION

N. BRUCE HANNAY

Transcript of an Interview
Conducted by

James J. Bohning

at

Seattle, Washington

on

28 December 1995

(With Subsequent Corrections and Additions)

ACKNOWLEDGEMENT

This oral history is one in a series initiated by the Chemical Heritage Foundation, on behalf of The Electrochemical Society. The series documents the personal perspective of key actors in The Electrochemical Society and records the human dimensions of the growth of the Society during the twentieth century.

This project is made possible through the generosity of The Electrochemical Society.

Hannay, N. Bruce
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Oral History Program

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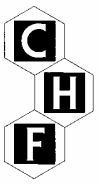

N. BRUCE HANNAY

1921	Born in Mt. Vernon, Washington, on 9 February
1996	Died in Bremerton, Washington, on 2 June

Education

1942	B.A., Swarthmore College
1943	M.A., physical chemistry, Princeton University
1944	Ph.D., physical chemistry, Princeton University

Professional Experience

Bell Telephone Laboratories

1942-1960	Research Chemist
1960-1967	Chemical Director
1967-1973	Executive Director, Research, Material Science and Engineering
1973-1982	Vice President, Research and Patents

Honors

1978	Honorary Ph.D., Tel Aviv University
1979	Honorary D.Sc., Swarthmore College
1981	Honorary D.Sc., Polytechnic Institute of New York
1976	Acheson Medal, Electrochemical Society
1983	Perkin Medal, Society of Chemical Industry

ABSTRACT

The interview begins with N. Bruce Hannay discussing the origins of his interest in electrochemistry and his awareness of The Electrochemical Society as an ideal organization for discussions and publications on topics related to solid state chemistry. The interview continues as Hannay recalls Bell Labs' support for his early activities in The ECS, which included organizing meetings and suggesting speakers, particularly within the Electronics Division. Hannay emphasizes the reciprocal relationship between the Society and Bell Labs, where he served as Vice President for Research during his ECS presidency. Hannay helped to further the Society's interest in solid state and corrosion work while he had responsibility for electrochemistry at Bell Labs. Throughout the interview, he comments on positive aspects of the Society's internal operations; its relations with other scientific organizations and companies, including the American Chemical Society, GE, and Bell Labs; and the influence of colleagues such as R.M. Burns and Charles Tobias. He also describes the Society's strong responsiveness to its members' needs, its influence on his professional development during the middle of his career, and his views of the future of both The ECS and electrochemistry in general.

INTERVIEWER

James J. Bohning is Professor of Chemistry Emeritus at Wilkes University, where he was a faculty member from 1959 to 1990. He served there as chemistry department chair from 1970 to 1986 and environmental science department chair from 1987 to 1990. He was chair of the American Chemical Society's Division of the History of Chemistry in 1986, received the Division's outstanding paper award in 1989, and presented more than twenty-five papers before the Division at national meetings of the Society. He has been on the advisory committee of the Society's National Historic Chemical Landmarks committee since its inception in 1992. He developed the oral history program of the Chemical Heritage Foundation beginning in 1985, and was the Foundation's Director of Oral History from 1990 to 1995. He currently writes for the American Chemical Society News Service.

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INTERVIEWER: James J. Bohning

LOCATION: Bainbridge Island, Seattle, Washington

DATE: 28 December 1995

BOHNING: This interview is part of a project sponsored by The Electrochemical Society to talk to their past presidents.

Could you tell me the origins of your interest in electrochemistry?

HANNAY: I really was never an electrochemist in the classical sense. I wasn't interested in that subject, but The Electrochemical Society took a major role in the publication and presentation at meetings of work in solid state chemistry. They were the leaders in that. I was a young researcher at Bell Labs and that was what my interest was. It was really that the Society came my way, rather than any interest I had in classical electrochemistry.

BOHNING: When did you first become aware of The Electrochemical Society?

HANNAY: It was when the boss of my boss told me about this activity of the Society, publishing papers in solid state chemistry. The time I'm speaking of is immediately after the invention of the transistor, and it became very important at our place to understand all we could about the materials and how to prepare them and how to handle them. It was a crucial part of the solid state technology, and a lot of it was just plain chemistry. It was electrical in a sense, in that it was putting atoms in a solid in places where they would have the right physical effects.

So this sudden interest of The Electrochemical Society was the first time I had ever heard of them. It was when R. M. Burns, the president of the Society in the early days, tossed out to me the idea that I should be looking at The Electrochemical Society as a place to publish.

BOHNING: What year was it then that you joined the Society? Do you remember?

HANNAY: No, I don't remember. [laughter] Actually—and they wouldn't be pleased to hear this—I didn't join the Society. That's sort of embarrassing to admit. Bell Labs generously

supported the Society and was a corporate member. They could probably name one or two people who could be their representatives, and I was in that category. But I never filled out an application and joined the Society. They made me an honorary member at one point, they made me president, and the company paid them. I got a free ride. [laughter] You had better put that in delicate terms, or they may come to me with a bill! [laughter]

BOHNING: What was the Society like when you joined? Did you go to its meetings?

HANNAY: Yes. At their meetings they had different sections. You could see the old traditional part. There was electrochemistry in its classical sense; there was electroplating, batteries, corrosion—all very useful, but nothing very exciting to a young researcher.

Then there was this other group of oddballs—the solid state group. Solid state chemistry didn't exist as a scientific discipline; it was something that was just springing up. We were there helping to create it. There was an Electronic Division which really had been classical electronics and luminescence. I don't know how they got into that, because cathode-ray tubes had been around for a while and the luminescence business was going, but there wasn't anybody in semiconductors because there wasn't anybody who knew what a semiconductor was. But this electronic division would accept papers and sponsor symposia in solid state chemistry.

Incidentally, I read [R. M.] Bob Burns' history (1), and it peters out just about this time. If you look at that, you'll find that he talks about this formation. He wound that up just a little too early to assess the impact of the solid state revolution on the Society and on the world. But he was a smart man, and I think he anticipated it was going to be a big thing, especially at Bell Labs and at other places like that.

The Society, however, probably had a few fights internally because they were getting these people in who didn't even know what electrochemistry was. They were jealous of their territory, but they had to admit that we were getting huge crowds of people coming in and paying their way for our symposia. That was pretty attractive.

BOHNING: Were you presenting papers on a regular basis then before the Society?

HANNAY: No, not really. I was already in a kind of junior management role and encouraged other people to give papers there. I don't know that I had a regular schedule of presentation of papers, but I went to the meetings and helped them plan symposia and so forth. Whether or not I gave a paper I don't recall, but I know I helped them organize their meetings frequently and suggested invited speakers and that kind of thing.

They were willing to do this because they recognized that there were a lot of people coming to the meetings. Very few of the solid state people were members, and the Society was getting a pretty large largess. One of the reasons a lot of us went was because the company was paying the registration fee at the meetings. All you really would do was register as a guest, although you would pay a lower fee as a member. But the company was paying the guest registration, so there was no reason to become a member.

In the early days the Society discussed how they were going to beat this system, because there was a disincentive for the solid state people to join the Society. I don't remember that I ever thought about it in those terms, but it kept a lot of people out.

BOHNING: One of the things I've heard about the early days of the Society was the friendliness of the people at the meetings. It was still small enough that there was quite an interaction between the people at the meetings.

HANNAY: Yes, that it quite true. If you went to an American Chemical Society meeting at that time, which as a chemist I thought I should do, it was like being in Times Square. It was terrible! And they couldn't have cared less. They really didn't care. They had no interest in our subject. It was dismal.

But if you went to an Electrochemical Society meeting, you knew those people in your field of interest and they were all coming. You could exchange ideas with them and talk to them, so it was a much better environment for a meeting place. I'm not knocking the American Chemical Society; it had its groups too, but not in this field. It blew this right from the beginning.

BOHNING: It almost sounds as if the solid state people were looking for a home.

HANNAY: Exactly! We were looking for a home. The Physical Society wasn't the right place. I published a few papers there, but they were really interested in physics, not in chemistry. They didn't want those grubby materials. The American Chemical Society was far too big and impersonal; they didn't want us. The AIMME, the American Institute of Metallurgical and Mining Engineers—or something like that—was starting a materials program, but it was more interested in traditional metallurgy kinds of material preparations, so they passed us out. They were the only competitors with The Electrochemical Society, but they were a little too restrictive in their attitude. The ECS was ready to try it and published all kinds of different aspects of semiconductors, and so The Electrochemical Society was really the place. Before very long they asked us to form a committee on semiconductors.

BOHNING: You mentioned that you were active in developing symposia. What other activities were you involved in before you became president?

HANNAY: Looking at your list (2), there were none in the local section. I didn't even know if there was one. In publications, only to a minor extent. In awards and prizes, we weren't thinking in terms of those. In the divisional activities, the solid state people took the electronics division over. That's what the Society was, as far as we were concerned. We invited speakers and set up symposia. It was our division. That was really pretty much it. Oh, I served on a couple of national committees of the Society. I remember spending some time on a long-range planning committee. Occasionally, I would do something like that. But mostly, it was the division that I was most active in.

BOHNING: Who were some of the big people in the Society at that time?

HANNAY: Now you're really going to test my memory. [laughter] There was Charles Tobias and Ernie Yeager. There were others, but I just can't remember. You see, none of these people were in solid state. We brought the solid state people in ourselves. There were GE people. I'm afraid I'm not giving you a very good answer, but I can't remember other names.

BOHNING: That's all right. I talked to Charles Tobias (3). I spent two days with him back of the spring of the year, in California.

HANNAY: If you had talked to me first I would have sent my regards via you. He's a good fellow. I like Charles.

BOHNING: Were you the first solid state person to become president of the Society?

HANNAY: I suppose I was. It was probably the first time that they reached out and got somebody from the solid state group.

On your question list you asked, "Why did you want to become president?" Well, I'm not sure I wanted to be president. [laughter] Bell Labs had been a strong supporter of technical societies and engineering societies, so they encouraged this. They made financial contributions, although not as generous as earlier. But they were always up there in the upper contributors. They were, however, particularly generous in encouraging the people who worked at Bell Labs

to contribute their time and work at the Society activities. That was a real contribution, especially in a field like solid state where they practically owned the field. So doing things for the Society was really in Bell Labs' interest and what they wanted done. So as far as becoming president of the Society is concerned, I was probably motivated because I thought it would be good for Bell Labs. It wasn't that I wanted the honor. I didn't even think of it in those terms. It was just that it was good for Bell Labs. We could help the Society and the Society could help us. A whole lot of people from Bell Labs were publishing in the Society's journal and going to the meetings. We had to do our part. So when they asked if I would like to be president, I said, "No, but I would serve." [laughter]

I had too many other things to do to want to spend all that time, but I enjoyed it.

BOHNING: Since I don't have my other notes in front of me, let me ask what your position was at Bell Labs at the time that you served as president.

HANNAY: I was afraid you were going to ask that. I think I was vice president for research, or about to become that. The position below that was executive director. I was executive director of the materials, science, and engineering division. If you really want to know that I'll have to look it up, because I don't carry that kind of information in my head.

BOHNING: That's all right. I was just trying to make the relationship, because you're emphasizing the Bell Lab part of your activity.

HANNAY: Well, The Electrochemical Society was actually of value as a technical society largely because of the people in the research areas of Bell Labs. But not all of it, by any means. We were farming out some of our activities in the development areas. That's a close one as to which came first. Whether I would have done this if I had just become vice-president of research—I might have said "No." I don't remember the transition, so I'd have to look up the dates.

BOHNING: Okay.

Was there any specific agenda you had as president of the Society?

HANNAY: No. It was really just to deal with things as they came. But there was at least one thing in which I got involved that is of some interest and that we might want to mention. There is a medal given by the Society that is called the Palladium Medal. The other medal is the

Acheson Medal. They had a committee to select the recipient; I think I was not yet president but about to become president, because I don't quite remember the sequence. The committee wanted to give the medal to a man named Benjamin Levich, who was a Jewish scientist in the Soviet Union. The Soviets were not letting any of the dissident Jews out; they were all being mistreated. It was very much in the news. You could have found something about that situation on the front page of *The New York Times* almost any day.

I had never met the man and I didn't even know his work. But here was this suggestion that he should win the Palladium Medal. I said, "Now wait a minute. Are you doing this because of the political aspects of it, that the Soviets have an oppressive society and they are cracking down on the Jews, and you have many friends in that group, or does he really deserve the Palladium Medal?" I had to satisfy myself. I had to be sure. So I inquired around and talked to my friends. They said, "He has done first-class work. He should win the medal, regardless."

Sometime in that period, I got a phone call from somebody who identified himself only barely and said he understood that I was interested in Levich. I said, "Yes. What is this call about?" He said, "Do you want to talk to Levich?" I said, "Yes, I'd like to talk to Levich, but how am I going to do that? He's stuck in the Soviet Union, and he wants to immigrate and take his family." He said, "Well, you can call him there." I said, "What do you mean?" He said, "We can give you a number, and he will be there between seven and eight o'clock in the evening, Moscow time on Tuesdays and Thursdays." I said, "That's very interesting. Let's try it."

So I looked up the time differences and made the phone call. And who do you think answered the phone? Levich! He was at a friend's house. He was getting phone calls there from his friends in the United States. A Jewish friend had a sort of underground here, and they decided to give me his number.

I had several conversations with Levich. He wanted to know what we could do to help him, and we discussed the situation. I told him he had won the Palladium Medal, and I said, "I don't think you want the money, because if we send it to you, they'll only take it away from you. Why don't we deposit it in an account here, and it will collect interest. When you get out, it will be here for you, and nobody else. It's yours." We agreed on that, and he was very pleased about the arrangement. We did all of this by telephone! I couldn't believe it. I dialed the number, because I could sit at Bell Labs and direct dial any place in the world. So I was dialing Moscow.

That was one of the most interesting things that happened during my term as president. Eventually the Russians caved in and let him and the other dissidents out. There were three or four of them who were very well known names at the time. One thing I can say is that Levich wasn't the easiest of the bunch to talk to. He was sort of feisty; he must have been a real thorn in their side. Sometimes I felt I had things fixed for him, and then he would screw it up. He would be determined to do something that would upset the Soviets, and it did; it always worked that

way. [laughter] Then you would read about him in the paper again. But he finally was allowed to leave with his family. A great part of the arrangement had to do with his children. They finally left and immigrated to Israel, and we sent him the money.

That wasn't an agenda. It just came along, but I felt as if I was accomplishing something, rather than just agreeing to routine committee appointments. Actually, my agenda for the Society was to further its interest in solid state work and see to it that that was well taken care of. By that time, I had responsibility for electrochemistry at Bell Labs too, so I was aware of the value of good work in corrosion and the other things, even though they weren't solid state.

When semiconductors came along, they didn't know how long that was going to last, but at least it was going to give a tremendous boost to the Society as a place for all the solid state work; if it wasn't semiconductors, it was going to be something else.

BOHNING: Was there a lot of internal politics in the Society, or did it operate fairly smoothly?

HANNAY: It operated very smoothly. If there were internal politics, I didn't see them. I know that in some societies, and I'll leave them nameless, there is some jockeying about who is going to be president, but The Electrochemical Society is not given to that kind of thing. So I would say it operated quite smoothly. Being president was an easy experience. I had a good executive secretary, Ernie [Ernest] Enck, who was an electrochemist himself. He had been persuaded to take this position after his predecessor had died unexpectedly. He was very competent.

[END OF TAPE, SIDE ONE]

BOHNING: What kind of relationship did the Society have with other scientific organizations?

HANNAY: It was pretty good. The Electrochemical Society was a participant with other societies in nominations and selections for the Perkin Medal, for example. It was a harmless activity, in the sense that it was no great threat. They were not in competition with other societies. They didn't need to be. For example, the ACS did not want these subjects. Electroplating and batteries and corrosion were not in the mainstream of the things the ACS was interested in. It was far more mainstream in organic chemistry. The ACS was no challenge, in terms of members or trying to push them out of the field. In fact, the ACS members were mostly disinterested. Once in a while they would set up a symposium in the field, and nobody would go. Why should we go to an ACS meeting where there were fifteen thousand people, just to attend a symposium that somebody has put together where you might get two dozen people in the audience?

BOHNING: What about the relationship with industrial sponsors? You have already mentioned Bell Labs.

HANNAY: The industrial sponsors were important even before the advent of the solid state chemistry group. GE was always supportive. After all, corrosion and electroplating were things that were important to GE. It tended to be the electrical equipment companies, any people who were in the electrical business, whether it be utilities, or manufacturing, such as Motorola. Texas Instruments was in it right from the beginning. Some of the chemical companies were interested, like Olin-Mathieson and DuPont. This was a small part of their business; nevertheless, they were not disinterested. I think if you were to look at the Journal in those days for industrial sponsors, there is not a single one that surprises you, because these were the things you would expect the technology to overlap with these traditional subjects. That is part of the general industrial picture. The battery companies were involved, but I would say the two biggest sponsors were GE and Bell Labs.

BOHNING: Were they cultivated by individuals, or did the Society cultivate that relationship?

HANNAY: Yes, the Society did, but it was because of the people involved. Suppose you were coming to meetings of the Society, and you found that a lot of other people from your company were coming to the meetings. You would go back and, particularly if you were involved with research administration, you wanted to see your company up there where it belonged in terms of its contribution. So the people were very much the catalyst for transmitting the need to the Society. But I don't think I was ever aware of a delegation going to a company. I think it was the people who worked at the company who were responsible. When I became president, Bell Labs was already established as a major contributor and I was not involved in that.

BOHNING: What was the relationship between the academic and the industrial contingents in the Society?

HANNAY: The science that The Electrochemical Society reported was mostly applied science. It wasn't deep fundamental stuff; it was pretty applied. An awful lot of the leading work was done in industry. The academics saw this and we got along pretty well, because they were consulting with industry, such as people like Charles Tobias. I'd say the relations were excellent. I never was aware of any counting up, like we have so many industry people and so many academic people. That goes on at a lot of places. Or else I was awfully innocent and

didn't see it, but I don't think so. I think there were very good relations. Of every activity I saw in the Society, I would say that was a non-problem.

BOHNING: What about various divisions within the Society?

HANNAY: That was no problem because they didn't talk to each other, they weren't interested in each other, they didn't pay any attention to each other. [laughter] With luminescence, maybe they were a separate group within the electronics division. That I'm a little vague on. The luminescence people were just a little group, and that was a residual of the Society's past interest. But it didn't matter to us. As long as they gave us a big enough room at the meeting site and didn't get in our way, we would get along just fine. There was no jockeying for anything. Now if there was some between, let's say, the electroplating people and the corrosion people, I'd be surprised. I never saw any sign of it.

BOHNING: I was just curious about when a new division started, how the other divisions acted.

HANNAY: They probably were a little jealous of us because we were obviously so successful. We had a huge crowd of people at our symposia, but it never led to anything that I could say was an attempt by them to limit us. They were too glad to have our registration fees. [laughter]

BOHNING: How has the Society contributed or reacted to significant events in electrochemistry?

HANNAY: Burns was the elder statesman in the Society. He was a past president and he still went to their meetings. He was an electrochemist himself. That was his natural field. Those discussions went on before I had any knowledge of or connection with the Society and were probably saying, "You know, we've got to do something to pull ourselves out of this stalemate we're in. We're not growing; in fact, we're shrinking. We're not getting our share." Burns was a good manager. I feel some affection for him because he hired me. In a general way he didn't force anyone to go to the meetings or publish there, but he just passed the word on. He talked to me and others, mostly to make people aware that the Society was interested our subject and would go out of its way to help organize symposia, which it did. I can't say Burns was entirely responsible, because I was not in a position to see whether he was or not. But he certainly was influential. He seemed determined that that was one way to make the Society grow.

There's a little bit of history here. The physicists who did the invention of the transistor—the three of them won the Nobel Prize—and particularly their leader, Bill [William] Shockley, who was a terrific talent in theoretical physics, didn't think it was necessary to have

single crystals of germanium. It's an unthinkable thought now. He said we could do everything we wanted to do with the polycrystalline material. He later made it very clear that he had really blown it. When I got brought in to the Bell Labs program, my job was to try to make the crystalline silicon. Shockley told me that he had done that with germanium and now he had found out the single crystal was necessary. There had been an awful lot of effort on these materials, and it wasn't Shockley who did that, it was over in the chemistry department, under Burns. Gordon Teal, later of Texas Instruments, was in the chemistry department and Burns gave him a laboratory and an assistant to support him. The physicists said, "Don't let that guy waste money here. Put him to work on something useful." Bell Labs was organized that way, so people could work independently. Burns laughed it off and continued to support him. Of course, Teal made the first single-crystal germanium and then these guys began to see that this was the future. What I'm saying is that that really happened through the intervention of the chemistry department at Bell Labs under R. M. Burns, who supported the kind of work that later was all-important to the whole solid state revolution. Things like zone refining were done by people in Burns' organization. I'm not claiming that he was the one who saw how far it was going to go—he would have been astounded to see how far it went—but nevertheless he provided a haven in Bell Labs for the people to work on this kind of thing, so they were protected from the physicists who would have wanted to put everybody to work on things that Shockley was interested in. As I said, Shockley conceded his error later on. I always got along very well with him.

BOHNING: He became a controversial figure later on.

HANNAY: Oh yes, he did. He was not a genius at presenting his ideas, because he was just brutally obnoxious in his presentations to the students. Actually, if you read what he said, he often said things that were true. But you had to be very careful how you said those things, and he wasn't careful a bit. But he was a true genius. He left Bell Labs because he wanted to become rich, and he wanted to run things. Bell Labs could have paid him more, but they drew the line at his running things. They gave him his part to run, but nothing else.

BOHNING: What was the responsiveness of the Society to its members' needs?

HANNAY: That was very good. I told you about the needs of the solid state people to have a place to publish and the freedom to arrange their symposia. The Society was very good. It didn't impose any rules on us. We weren't hard to take, and we got along very well with the Society's other members. A lot of the solid state people weren't particularly interested in the Society, and they weren't even members. But they said, "This is the place to be. This is the place to publish." The Society didn't say, "We're electrochemists and we've never heard of any of this stuff." Instead, the Society immediately answered the needs of the solid state people, so

I'd say the Society got very high marks on its responsiveness to the members' needs. It was willing to go along with what we wanted. It didn't tell the division, "You can't do this or you can't do that." And there was a very positive change in the Society, because it was then a stagnant society. They had done good things in electrochemistry, but it had become a stagnant field. There was a flurry of activity later on in batteries, and corrosion was always there. Luckily for the corrosion people, nobody ever applied the things that other people knew, so things were corroding all over the country and all over the world. With batteries, new ones were invented later. In fact, it was the solid state that was responsible for all kinds of batteries. That opened up new things for the battery people. I don't mean that the battery people of The Electrochemical Society were interacting with the solid state people, but they were selling batteries to people who were selling transistor radios.

The Society has certainly changed. I don't know about it now. I read what they send me in the mail, but I don't go to their meetings, at least partly because when you live here in Washington state, you don't go to many meetings. In fact, it's been a long, long time since I've been to one. I did go to the meetings when I was president of the Society, of course, but when you are vice-president of research for Bell Labs, you don't have time to go to meetings. You can give a speech, or something like that, but you don't have time for meetings. In a big organization, you ask other people who work for you, "Tell me in fifteen minutes what happened at the meeting that's exciting." [laughter]

BOHNING: The next question on the list is, how have your professional work and career and your contributions to science and technology been influenced by the meetings of the Society and your contacts with the Society and its members?

HANNAY: When I first started at Bell Labs, I was just doing what I was supposed to be doing, and I wasn't really concerned about the Society. Then far after that, when I was vice president for research, the Society wasn't influencing me and I didn't have much time for it. But there was an intermediate time, when I was rising through the various levels, when I had time for this. You can go to the meetings and help organize symposia. You hear things because you are meeting people and you go out to dinner with people, so you find out what they are doing. It's a great place to exchange information informally as well as formally. I knew all the people there. This was a place where I could go and count on talking to them. We'd go out together in a group for dinner, probe each other to see what we could learn. It would all be aboveboard. You would learn what they were emphasizing. You wanted to hear their papers. You wanted to find out what they were up to. They might be presenting a paper on some subject, but they weren't really working on that anymore. Did they have something else worth doing? So these were all the reasons for running a meeting when I was a middle-level, junior manager. Later on, you got too busy and somebody else in your organization would be doing exactly the same thing.

BOHNING: The next question is, what should the Society do in the future?

HANNAY: I don't really know what they are doing now. Opportunities like the solid state group don't come along very often. Some things are quite inappropriate for the Society, like computer software. I think what happened was they got propelled into the technology that was going forward, but it's beginning to mature. It's changed far more than anybody could have dreamed and it will change a lot more. They still have plenty of years running on that.

With the American Chemical Society, you might say, "The reason I'm a member and go to their meetings is because I'm a chemist. The American Chemical Society represents the American chemist, and that's professional. Never mind what they do. They represent us." Two-thirds of their members are organic chemists, and by golly, that's what two-thirds of their meetings are all about. But very few people are going around saying, "I'm an electrochemist. The battery people and the corrosion people are still saying that. But they haven't changed significantly in numbers. So regarding these other things that are going on, particularly the solid state group, one just has to say that's not the kind of an opportunity that comes along very often. It's to the credit of the Society that it grabbed the opportunity and ran with it.

BOHNING: Finally, what about the future of electrochemistry?

HANNAY: The future still looks great for the solid state, up to a point. But when a child says, "I want to go into some field of science. What should I go into?" if it were twenty-five or thirty-five years ago, I would have said the solid state, but I wouldn't say that now. Now it's computer software. For Bell Labs, they emphasize communications, so it means a de-emphasis on solid state. If I were directing research at Bell Labs now, I wouldn't be pouring all that money into electrochemistry; I'd be pouring it into software. But the wave of the future is in biotechnology and the life sciences. So if I know what the wave of the future is, what's the role of The Electrochemical Society? That's the way they have to think about it. Instead of saying, "What should the Society be doing?" they need to think first what the wave of the future is, and then, "Is there anything that we can do in that wave? Is there anything in the life sciences we can do?" That way you have a wedge; it's a start.

[END OF TAPE, SIDE 2]

BOHNING: Is there anything else you would like to add?

HANNAY: I don't think so. I think I've told you more than I know. You're obviously capable of modulating it so it doesn't sound as unreasonable as it sounds in the original version.

BOHNING: I appreciate your spending this time with me.

HANNAY: Well, you came all the way from Bend, Oregon. All I did was drive down the Olympic Peninsula.

BOHNING: We will transcribe this session and send it to you for your review.

HANNAY: About three years ago they wrote me and asked if I would help the Society in preparation of the centennial celebration. I said I would, and then I found out that it was in 2001 or something. I said, "You've already been talking about this for three or four years, and we're still five or six years away from it."

BOHNING: That's called advanced planning. [laughter]

HANNAY: Two people who were very helpful and are still active are Bob Frankenthal and Paul Milner. They are both very fine people.

After I talked to the people at the Chemical Heritage Foundation about doing this, I found to my astonishment that in the history that Bob Burns wrote (1), he stated that Frank Biondi was the one who suggested the formation of the electronics division. I was involved in the original group, but I wasn't in charge of it. There were only about six or eight of us, and Frank Biondi was there. His son, Frank Biondi, Jr., is now a very successful financial wheeler-dealer in these communications companies. He's been written up in *The Wall Street Journal*. But if Frank Biondi is still alive, he would be a great person to talk to. I strongly recommend that you do that. You could get Frankenthal or Milner to look him up in the Bell Labs directory and find out where he lives. He lived in Livingston, New Jersey at the time he was at Bell Labs.

I would also talk to Morgan Sparks. He was the chemist who went out of the electrochemistry group over into the solid state work when it was still a very small group. His name is one of the three who worked on the junction transistor, not the original transistor. But he didn't get the Nobel Prize.

[END OF TAPE, SIDE 3]

NOTES

1. Robert M. Burns with Ernest G. Enck, eds. *A History of The Electrochemistal Society, 1902-1976.* (Pennington: The Electrochemical Society, Inc., 1977).

2. James J. Bohning, *Chemical Heritage Foundation Oral History Project, The Electrochemical Society Project, Interview Agenda—Society Presidents*. See Chemical Heritage Foundation Oral History Research File # 137B.

3. Charles W. Tobias, interview by James J. Bohning in Orinda, California, 15 May 1995 (Philadelphia: Chemical Heritage Foundation, Oral History Transcript #0146).

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