Nobel Voices Video History Project, 2000-2001

Interviewee: John Pople
Interviewer: Neil Hollander
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HOLLANDER:

Doctor, could you please introduce yourself to us, tell us who you are and what is it exactly you do?

POPLE:

Well, my name is John Pople. I am a theoretical chemist engaged mainly in the use of mathematical methods in exploring the properties of molecules and their chemical behaviors. This is a wide field, in which I've been active for the best part of fifty years, more than fifty years, in fact, during my whole professional career.

HOLLANDER:

Doctor, why did you become a chemist and not a writer or a plumber?

POPLE:

Well, that's an interesting question, because I was not originally a chemist. When I was a young boy, aged eleven or twelve, I became extremely interested in mathematics. I used to think about mathematics in all my spare time. I used to read books, old textbooks that I took out of the wastepaper baskets and so forth about mathematics. So I learned a lot of mathematics at that time.

I became a chemist only much later after I had been to university and had taken a degree in mathematics. At that point, I decided that I was not going to be a pure mathematician to devote my whole life to mathematics, but rather that perhaps I felt that I wouldn't be good enough to be a pure mathematician, so I decided that I would use what mathematical talent I had in some branch of science.

I thought about several possibilities. One was fundamental theoretical physics, but I thought that was really rather difficult. You were competing with famous people like Einstein and so forth. It did then occur to me that the field of chemistry was one in which there had not been too much in the way of theory, and that this might be an opportunity where I could make some progress and some contribution. So I did not become a chemist until early twenties, maybe twenty-two or twenty-three, and in fact, I did not become a

professional chemist, that is, I did not have a position in a chemistry department until I was nearly forty.

My initial way of making a living was, again, to teach mathematics. I was on the faculty of mathematics in Cambridge, and I taught mathematics there for a time. Then I went to a physical laboratory, actually the National Physical Laboratory in England, where I was sort of administrator for a while. It was not until 1964 when I was aged thirty-eight that I moved to the United States and actually became a professor of chemistry.

Actually, there's an interesting story about that, that the American Chemical Society, of course, is a very large organization, has a great deal of bureaucracy. When I arrived in America as a professor of chemistry, the local American Chemical Society said, "Well, you should become a member."

So I said, "Yes, I should."

So they gave me a large form to fill out, and on this form it said "List your degrees in chemistry." I put "none" under question one. Then the second question was "If you have no degree in chemistry, list all the classes that you have taken in chemistry and give your grades." So I put "none" again, because I had never taken any courses. So the authorities said, "Well, I'm not sure that we can even admit you to the member of the American Chemical Society without appealing to some central authority." So I think they had to write to Washington in order to get me membership. So for many years, I was really an amateur as a chemist and still am in some sense.

HOLLANDER:

Doctor, we're dealing with a Nobel laureate in chemistry who never went to school.

POPLE:

Never went to school in chemistry, that's correct. I took chemistry in the early years of high school, but I didn't do it in the later years in high school. So my knowledge of chemistry comes later in life. I found that quite useful because I've not been exposed to the standard dogma. When I sometimes read what freshmen are taught in early chemistry courses, my reaction is, "Well, this is nonsense. How can they be taught this stuff? This has been disproved long ago." So I did have the advantage of having a fresh approach.

HOLLANDER:

You won the Nobel in chemistry.

POPLE:

That's correct, for the use of mathematics in chemistry, basically. This is the application

of the laws of quantum mechanics, which are the mathematical laws which are really behind the whole chemistry, but which lead to complicated mathematical equations. I've spent my career trying to not quite to solve these equations, but at least to get good enough approximation to them to become useful in actual chemical problems.

HOLLANDER:

Is there any way we could draw some sort of line or link between what you do and something very practical that is either existing now or will exist in the future?

POPLE:

Well, that's quite a long way, because though there are connections, because what I have done is to develop the mathematical methods which can be applied to virtually any chemical problem. We design a method for studying the property of a molecule, like its shape or how strong are the bonds, which will apply to any molecule. That's my field of expertise. Now, these programs can then be used, and are used, by many chemists within academia and in industry to explore molecules that are of particular interest to them.

So in response to your question, some people use the programs, the theories, that I and my colleagues have developed, to test molecules as potential drugs by seeing how they attach themselves to enzymes. Now, you can do this by doing a calculation on a molecule attached to a model that's a piece of an enzyme. You can actually do computations on that to see whether there would be a strong interaction or a weak interaction to get some feel as to whether the drug might or might not be effective.

You don't prove it's effective that way, but you can do a sort of preliminary exploration. You can look at a large number of potential molecules, potential drugs, by doing a computation, first of all. Then if you find one that looks as if it would be promising, then you can ask an organic, a real chemist, to go ahead and make the drug. Then you can start doing tests on animals and ultimately on human beings. So there's a definite role here, a somewhat indirect role, in important practical problems.

HOLLANDER:

These programs that you're talking about, do they make you a kind of inventor in a way?

POPLE:

Well, the invention really is the formulation of the original theory, which was the theory of quantum mechanics, which was done in Germany in the 1920s. What we have done is perhaps we have invented particular mathematical procedures for coming close to the solution of these problems. So there is a sense there is invention. It's mostly developing new mathematical methods which are efficient and can be programmed onto computers. We have relied, of course, enormously on the extremely rapid development of computers

over the last thirty or forty years.

HOLLANDER:

Doctor, what do you believe is the significance of the Nobel as an the institution?

POPLE:

Well, the Nobel Prizes are, I think, of considerable significance in providing some sort of achievement level in science. They do attract a great deal of public attention, and this serves a useful purpose in helping making science familiar, the results of science familiar to the population of the world as a whole.

The only reservation I have about it is that it is rather arbitrary to cut off at a certain level. Certain people receive the Nobel Prizes, and there's a large number of other excellent scientists who do not receive the Nobel Prizes. Those who do receive Nobel Prizes receive much more public attention and asked their opinions about all sorts of matters, political matters on which they may not be expert, where there are many others who are not similarly in the public eye. But nonetheless, it does pay an important role in focusing the attention of the world population on science to some extent.

HOLLANDER:

Vis-à-vis your other colleagues in the field, do you ever field guilty for receiving the Nobel in that sense?

POPLE:

Yes, I think I do. I feel that my students who work for me, of course, have had a major role in the breakthroughs being accomplished, and the Prize would not have been received by me had they not worked so hard and done so many things. So I always emphasize the great role that others have played. Of course, like most fields, we do go to meetings and we talk to each other and we exchange ideas. So probably ideas that I have included have come from other people, and mine have gone into their programs. So there's a lot of exchange. So there's some feeling of guilt, that's right.

HOLLANDER:

Where do you feel we're going from here with science?

POPLE:

Well, the role of science is going to continue to be a very large one. The developments in technology that have taken place in recent years, particularly the ability to handle huge amounts of information, are going to continue to play a major role not only in being able

to access and manage large amounts of information, but also in developing automated procedures for carrying out tasks which might have been previously being done manually. That's illustrated by the last lecture that I've just been to on the possibility of really replacing much of the work that individual physicians or doctors do by computer programs. Dr. [Kary] Mullis was talking about using optical disks with blood samples, feed it into a computer to analyze what's going on in a way which could be much more effective than the local doctor. This is a very good example. It may or may not work, but at least it's potentially the sort of thing that will come along. So all these aspects of science are going to advance, and the applications will go along with the new technology that comes with it.

HOLLANDER:

Doctor, on a slightly different plane here, do you have other interests outside of your academic ones?

POPLE:

No, I wouldn't say I have a great many other interests. Science is a very consuming operation. I have a family who are children and grandchildren. I spend great times with them. I've had a supportive marriage all my life, so that's played a great part in my time. I wouldn't say I have any expertise in any field.

HOLLANDER:

Do you read the literature?

POPLE:

Oh, yes, I read the literature. I take some interests, certainly, in world affairs, and perhaps now more than before I'm asked to express my views on world politics and environmental concerns and so forth. That's quite appropriate. I think it's extremely desirable that all scientists, whether they are Nobel laureates or not, should have clear views as to the social consequences of what they do and be willing to be active in talking about them.

HOLLANDER:

Is there any particular world issue now that you have focused on?

POPLE:

Well, I haven't focused on many in particular, but there was one question that was raised in the discussion on the environment the other day, and that has to do with the future of energy sources. I am one who holds the view that—and this is contrary to a lot of people

in Germany, I understand—I am one who holds the view that nuclear power is the only real way in which we can solve the energy problem in the next century if we are not to destroy the atmosphere by overburning of carbon fuel and using other environmentally damaging methods. But nonetheless, there appears to be a strong political movement against nuclear power, which has its problems, but I think it's really the only way in which mankind has a good energy future. So I do hold views on that, which I have expressed.

HOLLANDER:

Do you read literature as well?

POPLE:

Do I read?

HOLLANDER:

Literature as well?

POPLE:

You mean nonscientific literature?

HOLLANDER:

Yes.

POPLE:

Yes, I have read. Well, I'm probably now mostly interested in reading history. As one gets older, one gets more interested in history. I read a lot now on the history of science, which I find fascinating.

HOLLANDER:

[inaudible]

POPLE:

Yes, in recent years. When I was young, I used to say history of science is of no interest, because it's all known. Now I've become more interested in how people find things out, and I think that's a fascinating topic.

HOLLANDER:

Thank you very much, Doctor.

POPLE:

Thank you.

[End of interview]