III-8-2. Opening Speech

W. F. G. Swann

Bartol Research Foundation of the Franklin Institute
Swarthmore, Pennsylvania, U.S.A.

When I unexpectedly founded myself as the chairman of this meeting, I inquired just what expected of me. The answer was what I was to do I like, but it was inferred that a few opening remarks might not be inappropriate. Now in the physics of laboratory, the investigator is able to choose his experiments to be simple in form and simple in interpretation. In the physics of universe, however, we have to take what is presented to us and do the best we can. We feel that we are acquainted with what we know as the fundamentals upon which nearly all the phenomena, we are interested in, are depended so that in the sense our problems present no matters of perplexity but they present the problems of all or almost infinite complexity.

In the laboratory we can confine to the cases frequently where the interests center on simple aspects of fundamentals. Everyone can deduce from the fundamentals means whereby to understand the operation of the ordinary radio circuit or even of vacuum tube. But this is not always so. Certainly it is not so in the great cosmos and it is not so almost in the affair of mankind. I have been accustomed to citing a little parable which, I hope, you will bear with me concerning an old violinist who appears to perform with violin which, he tells me, is made by Stradivarius, the greatest maker of old times, who put some soul in this instrument and for which reason and other reason, it is now worth 50,000 dollars. I say to my friend that you are very naive and I am a student of physics and I know about acoustics and if you and I should get together I think I may for my knowledge be able to say something to you which will be able to improve playing of your violin. So the old violinist says, "Here is the violin and play it." Well, I do not mean that particular instrument indeed that seems to be very stupid instrument, it is defined by no form that any scientific principles can underwrite. We must not discuss such a complicate situation. We must start a simple manner, and so I ask the old man to think of string between some 2 points. I explain how the amplitude of this string determines the loudness, the tension of string determines the frequency of vibration, harmonic quality and so on, and he will manage very much impressed by all these, but also very bewildered and he suggests, we should play the instrument, so we draw the bow cross on this string. Of course, we do not hear anything, you see, you do not hear from the string between 2 points like that. The old violininst complains he cannot hear anything. I tell him I think it is unreasonable following to adapt this attitude. We must start with simple things to understand the complexity and it is very much better for you to understand that which you do not hear, than to hear which you do not understand, which makes the old violinist go the way rather sad but little confident by the fact, although it has nobody doing to know how to do it. Now here you see we have the ordinary pose of life. The problem which is the interest, the whole interest as a musician centers upon the complexity of problem which we, physicists, try every possible way to avoid.

As a matter of fact, in the affairs of most or many affairs of men's sociology and so on, we are concentrated with the problem of this kind. Pure scientists, physicists, are ones who know all about the fundamentals but frequently very little about the solution. Now the inventor is the man who knows nothing about the fundamentals but all about the solution, because he practically knows every case occurred in the nature as far as he can and each separate case represents solution of fundamental equation. In the last analysis, he practically knows everything, so he knows all experiments which give you form.

Totality would be no more than fundamental, because totality of all situations in this kind represents the totality of all solution of equations themselves, and this is no more than the statement of the contents of equation. However, he gets success by manipulating solution even though he has not obtained this mathematically but experimentally and because he knows this is so, that is so, by joining these together he can get something else which is so. As a matter of fact, even according to mathematical physics, Kepler's law, for example, you can manipulate Kepler's law and the different law to get other conclusion without, even though it has not been able to trace them from the fundamental law, inverse squares. So perhaps in the last analysis the happy combination of ingenuity of the inventor and regular discipline of the pure scientist will in the end prevail most efficiently to the advancement with battle which we have with terrible complexity we find in this great subject.

Now I will shut talking my nonsense and will call upon the first speaker, Prof. Rossi who will address on the subject of this problem.

III-8-3. Lecture on Future Prospect

B. Rossi

Dept. of Physics, MIT, Mass., U. S. A

Mr. Chairman, ladies and gentlemen. If we look back to the history of cosmic-ray research, we see that, from the outset, the interest of cosmic-ray physicists has ranged all the way from the smallest objects known to man to the largest—from the atom and the sub-atomic particles at one extreme to the galaxies and the whole universe at the other.

Now, between the atom and universe lies the whole of our physical world. And yet, until recently, cosmic-ray physics had managed somehow to conserve its individual identity, distinct from all other branches of physics. There were problems that belonged unequivocally and exclusively to cosmic-ray physics. Foremost among them were the problems of discovering the nature of primary cosmic rays, and the problem of explaining the genetic relationship between the various components of the secondary radiation found in the atmosphere. Also there was a time when the whole field of meson physics was the exclusive domain of cosmic-ray physicists; and there was a time, a few years later, when the study of the strange particles belonged exclusively to cosmic-ray physicists.

Now, however, we are faced with an entirely different situation. Most of the problems to which the cosmic-ray physicists applied themselves in the past have been solved. Other problems, of course, have arisen and they are even more stimulating and more exciting than the old problems, but here cosmic-ray physicists can no longer work in the condition of relative isolation in which they used to work in the past. Now the cosmic-ray physicists must work hand in hand with geophysicists, with astrophysicists, with plasma physicists, with physicists specialized in high-energy accelerators, and so on. Indeed, many of us find it necessary to stretch the meaning of cosmic-ray physics in order that we may continue to call ourselves cosmic-ray physicists.

In the years to come, it seems that cosmic-ray physicists will find their most important problems in two fields: the field of high-energy interactions, and the field which, for lack of a better name, I would like to call the physics of space. By this I mean the study of the space between planets of our solar system; the space between stars of our Galaxy; the space between the galaxies of our universe.

Prof. Powell will discuss the implications of cosmic-ray studies in the field of high-energy interactions. I would like just to touch upon some of the problems which cosmic-ray physicists will meet in the field of space physics. The two fields—physics of space and high-energy interactions—have a certain area of overlap and the most impor-