Book Reviews

A Great Collaboration

The Big Machine. ROBERT JUNGK. Translated from the German edition (1966) by Grace Marmor Spruch and Traude Wess. Scribner, New York, 1968. viii + 248 pp., illus. $6.95.

High energy physics is the most exciting, vital, and crucial frontier science. Its intellectual level is the ultimate that has yet been reached in human history. Believing all this as a high energy physicist, I am nevertheless a bit startled to find someone else, not trained as we are to be so objective, who seems also to think this way. And that he should write a book about it is even more impressive.

The Big Machine is a journalistic chronicle of the development of CERN, the Center for European Nuclear Research, a cooperative enterprise at Meyrin, Switzerland, of 11 European countries for the purpose of carrying out research in particle physics with the use of high energy accelerators. Not only is CERN sensational as a laboratory but it is probably the most successful example of intimate international collaboration in history. This collaboration extends from the highest level of government—member countries often vote more funds for the Meyrin laboratory than they give their own scientists in the same field at home—down to the working level of teams of physicists and technicians merrily communicating in a melange of multi-accented English and broken Fortran. Thus its inception and the politics of its success are important stories, told here by Jungk with verve and colorful detail.

Jungk, who also wrote *Brighter Than a Thousand Suns*, has considerable experience in listening well to scientists and is fascinated by the sociological and political modulations of the scientific enterprise. In the recent spate of books concerned with "big science" and big scientists, Jungk's must be classified as friendly almost to the point of embarrassment.

The author sketches a portrait of CERN today, a vibrant, dynamic institution spilling over its original site outside of Geneva into the adjacent French farmlands. He then leads you back to its state as a gleam in the eye of physicists returned to their bare laboratories after the devastation of World War II. He tells of the years of organization, frustration and setback, and finally exhilarating breakthrough in both the politics and the technology to what were then, on both fronts, completely new and imaginative concepts: on the one hand, an international collaboration of recent antagonists, exhausted by years of war, binding them—for the purposes of highly esoteric research—to contribute a substantial fraction of the monies they each devote to research; on the other hand, the Big Machine—a device to accelerate protons to an energy of 30 billion volts, at that time ten times the energy of any other accelerator.

Jungk makes graphic attempts to convey the "things" of today's laboratory (flashing red lights, the green glow of oscilloscopes, towering concrete cliffs manipulated by giant cranes); the scientists (perhaps too many are "brilliant, young . . .," now philosophical, now hopelessly out of this world); the science (the superficiality hurts the most here). A parallel concern is the interaction of the tripolar centers of U.S., European, and Soviet accelerator laboratories, drawn together by the commonality of objectives and the vast expense of future dreams. A chapter, which is perhaps the most agonizing, attempts to contrast recent discoveries in high energy physics with the problem of relevance, the interplay of basic and far-out research on the one hand and on the other a world groaning with urgent social problems, problems largely created by a technology grown from a previous era of esoteric discovery. A useful anecdote that illustrates the problem concerns a Soviet physicist who responded to my question about his wartime activities by telling of his design work on the 600 MeV synchrocyclotron now at Dubna. I greeted this with amazement. "Where was this?" "In Leningrad, all through the siege."

The contrast with Western policy was and is devastating. Whereas the French drafted scientists to fight in Algeria and the U.S. drafts graduate students for Vietnam, Soviet physicists were designing high energy accelerators during the siege of Leningrad. Now a siege is a rather urgent social problem; and although not everything the Russians do is right, there must have been the conviction that, sooner or later, *that* social crisis would pass and that continuity in the evolution of knowledge is a requirement of their society.

There is also here an attempt to draw the distinction with technology. After all, what is it that really distinguishes man from his cave-dwelling ancestor? Is it his vision of himself as the inhabitant of a planetary speck in a vast universe? or is it the convenience of his 100-story treehouse? Is it his grasp of the atomic and molecular composition of the things around him and their more or less orderly and predictable motions? or the elegance of his nuclear-tipped war club? The discovery of relativity and the quantum? or the discovery of internal combustion and air pollution? And then, Jungk seems to draw the conclusion, is it not also his table of particle resonances, the properties of neutrinos, and the validity of parity and time reversal invariance?

I have found no important errors of fact in this book, only a strong European bias which shows up in many places, as in the barely perceptible credit given Brookhaven Laboratory for the invention of strong focusing, upon which the CERN design was based, or the one-sided story of the race between CERN and the U.S. lab to do neutrino physics (yes, Virginia, scientists do love recognition, but only since Pythagoras). There is a more serious drawback in the general treatment: the popular, journalistic style cannot help perpetuating clichés about science and scientists, such as that there are no dumb physicists (there are!), that all experiments are important (few are!), and so on. But the book is kind to the subject I love, it reads easily and tells a good story, and this may be all one should ask.

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