

Editorial

Megascience

In the last issue of *Physics in Perspective*, we wrote about the New Big Science, an important transformation in the climate of large-scale physics in which research environments have come to resemble ecosystems, with complex and evolving interactions between individuals, institutions, and external developments. An article in this issue illustrates another transition in large-scale physics, having to do with transformations specifically in high energy physics experiments.

“E-36: The First Proto-Megascience Experiment at NAL,” by Vitaly S. Pronskikh, is about the experiment that initiated Fermilab’s experimental program in 1972. Although the E-36 experiment lasted only two years, its legacy persisted much longer, for it led to a string of subsequent experiments that incorporated different targets and techniques. The experiment was also a collaboration whose members included Soviet and Soviet-bloc scientists. The efforts both sides expended to make this collaboration work in the midst of the Cold War was indicative of the collaborative, international spirit that would come to define high energy physics through the late twentieth century and into the twenty-first. Being enmeshed in macro-level politics had micro-level consequences, and the E-36 collaboration initiated international collaborations whose effects also persisted well beyond the experiment.

Historians Lillian Hoddeson, Catherine Westfall, and Adrienne Kolb introduced the term “Megascience” to characterize experiments that are of an unprecedented scale in terms of equipment, experimental groups, and budgets, and that involve “strings.” By strings, the authors were not referring to the controversial “string theory”; they meant that the experiments are not staged once and then disappear, but continue to have an evolving presence in an experimental program (a “string” of experiments), and sometimes even no clear-cut end. The experiment, so to speak, becomes a long-term fixture of the institutional stage itself. Although the E-36 experiment itself officially ended in 1974, it morphed into other experiments that lasted until 1977. Moreover, whereas the E-36 string lasted five years, other experiment strings to follow persisted for decades.

As this article illustrates, Megascience experiments involve a distinctive kind of research climate. One is politics: “megascience experiments act as supranational organizations,” the author writes, “bringing nations together in times when severe political winds blow in the world.” This raised unusual issues of communication and red tape; the measures taken even involved efforts to reduce the isolation of

spouses of experimenters. Yet such efforts also created unexpected opportunities for the collaboration members to become “unofficial ambassadors,” a role for which, the author observes, the physicists were often more effective than career diplomats.

When Alvin Weinberg coined the term “Big Science” in 1961, he used it like we might use “Big Pharma” or “Big Oil”—as a slur. Its big machines were optimized for questions with little bearing on immediate human concerns. Its big laboratories clogged up the practice of science with bureaucracy. Its big budgets bred complacency. Weinberg warned that overinvestment in monuments to the whims of a privileged few, coupled with the neglect of more basic human needs, was usually a sign of a civilization on the brink of hard times. Conceptual tools like Megascience and New Big Science add new dimensions to our understanding of this otherwise monolithic concept. Weinberg possessed an unusually keen eye for the challenges of his own time and offered a caution against changes many of his peers embraced uncritically. What he lacked was the historical perspective we can now apply to the changes he described.

The New Big Science allows us to see how large machines broke away from the dominance of a single research program and supported a great variety of research. Similarly, Megascience exposes features such as the collaborative internationalism that allowed the E-36 research team to reach across the Iron Curtain at a time when it was nearly impregnable. These concepts, we think, help us now, with the benefit of hindsight, to understand more completely the institutional developments brought about by Big Science.

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