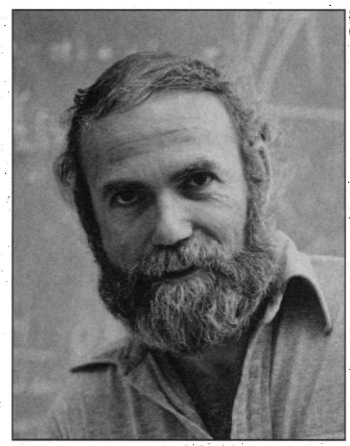
Ad Hoc Team Revives SSC Competition

With only one experiment approved so far, high-energy physicists are racing to put together a second by July

Dallas, Texas—HIGH ENERGY PHYSICS HAD a lot at stake last week when nearly 200 of its best and brightest researchers showed up here to discuss possible new experiments for the Superconducting Super Collider (SSC). When L*, a $762-million contender for one of the two large detector slots at the SSC, abruptly collapsed last month (*Science*, 17 May, p. 908), laboratory managers quickly agreed on the importance of finding a replacement. The main reason: The viability of the SSC's experimental program depends heavily on the existence of two complementary detectors that will begin taking data at the same time. Finding a timely replacement for L* has thus become an urgent task.

The physicists gathered in Dallas rose to the challenge. Along with a handful of observers from European, Soviet, and Korean laboratories, the eager attendees from U.S. institutions arrived at the SSC's temporary headquarters here, networked with their colleagues, argued over alternative detector technologies, and, by week's end, emerged with a plan. Physicists from a large number of prominent high-energy physics laboratories, including the California Institute of Technology, MIT, Columbia University, Boston University, and several national laboratories, announced their intention to form a new collaboration under the temporary direction of Caltech physicist Barry Barish and Columbia physicist Bill Willis.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Caltech physicist Barry Barish

But high-energy physicists can't yet afford to break out the champagne. The Barish-Willis team has a lot of ground to cover before it can offer even a proposal, and it has little time. By 8 July, the next meeting of the SSC's Program Advisory Committee (PAC), it must elect its permanent leaders, begin trimming an extensive list of alternative detector subsystem technologies, and prepare a report for the PAC. The stakes are high: The PAC will recommend whether or not to provide the collaboration with about $10 million for an initial design proposal—a necessity if the team is to come up with a viable detector.

In addition to facing an early deadline, the collaborators must reach a consensus on difficult technical issues. The team will have to take a variety of disparate ideas, designs, and technologies and put them together into a cost-effective detector that will effectively complement its competitor, the already-approved Solenoidal Detector Collaboration (SDC). The new project will also have to overcome some old rivalries, forging agreement between competitors—particularly physicists previously involved in L* and EMPACT/TEXAS, another detector proposal that was rejected last January—and others who were not previously involved in either project. While these tensions didn't emerge in public, they weren't entirely hidden, either: One former EMPACT/TEXAS member privately derided the newcomers as "interlopers," while another described the workshop as "the mating dance of the scorpions."

The Dallas convocation, however, seemed to flow smoothly—thanks largely to an unofficial meeting Barish had called at Caltech just 2 weeks after the L* cancellation at which physicists from 27 institutions began laying the groundwork for a second detector. Although many groups at that meeting were initially suspicious of one another, Barish explains, they found that "differences in opinion over what the detector should look like...converged very rapidly." Relying on a series of exercises based upon a "descoped," $500-million L*, the group created what it now calls a "straw man" design it will use as a yardstick to evaluate alternative ideas. Although Barish stresses that the new collaboration will consider ideas from all quarters, the descoped L* is likely to dominate its competitors simply by virtue of the engineering and design work already put into it. In fact, several alternative designs proposed during the workshop were received politely, but without noticeable enthusiasm.

Beyond the technical challenge, however, the new team faces a serious funding problem. Designers of the two main detectors have been instructed to plan on a budget of no more than $500 million each, only half of which will come from the U.S. government. To some, these conditions seem unreal. "Getting $250 million in foreign support is a dream, just a dream," says one Boston University physicist—a perception reinforced by the small foreign presence at the workshop. Others, such as laboratory director Roy Schwitters, aren't so pessimistic. "I imagine most [foreigners] are going to stay on the sidelines until the dust settles," he says. He anticipates more foreign interest once a design for the second detector has firmed up.

Another source of potential trouble is the cost of the SDC, which an internal SSC cost panel recently estimated at $712 million. SDC chairman George Trilling says his team is busy descoping for the next PAC meeting, but he is obviously ready to argue that his detector deserves the lion's share of federal funding: "I am not prepared to say we can build a general-purpose detector for $500 million."

Not even Trilling, however, disputes the scientific and competitive importance of building a second detector. If the second detector were to fall through, the SSC's experimental program certainly will be compromised (although some argue the damage would be minor). For instance, one of the SSC's main goals is to discover a particle known as the Higgs boson, which under the reigning Standard Model of theory gives particles their mass. There are several possible ways in which the Higgs boson might be discovered, however, and the SDC alone isn't capable of covering them all. One possible Higgs decay produces two energetic gamma rays, for instance, but the SDC can't measure photons precisely enough to detect them—a capability the second detector most likely would provide.

Although the Barish-Willis team is confident it can pull together a credible proposal in the time allotted, some members are painfully aware that their effort could easily fall into what one called "D0 syndrome"—so named after the second large detector at Fermilab's Tevatron accelerator, whose startup has been delayed by limited resources until next year, putting it nearly 5 years behind the Tevatron's other main detector. To avoid D0 syndrome, the new collaboration is going to need all the technical skill, discipline, and harmony it can muster—and probably more than a little luck.

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