There is another example that has had a major impact on our field. Although the CDF detector was not designed to be a high resolution meson spectrometer, a group of young physicists believed that rare, exclusive, final states in B meson decay, constituting less than 0.1% of B decays, could in fact be reconstructed in CDF, and that this would allow important properties of the B meson to be studied. They were successful and published the results. This convinced a previously skeptical high energy physics community that important studies of the electroweak interaction could be carried out with B decays at hadron colliders.

As mentioned in Flam's article, Martin Perl's success in discovering the tau lepton within the context of a large collaboration is an example of the ability of individuals to pursue their own physics interest. However, Flam quotes Perl as saying that this was possible because the SPEAR experiment "was designed without specific goals . . ." and Burton Richter as saying, "We wanted to look for new phenomena." The implication is that the large experiments today are different, that they have, instead, single scientific goals. This is not so. The CDF and D0 experiments at Fermilab, the LEP experiments at CERN, as well as the SDC and GEM experiments at the SSC, were not approved for a single physics goal, but rather to search for new phenomena at the highest available energies in $\bar{p}p$ and e^+e^- collisions.

This is not to say that there are no problem with very large collaborations. There are certainly sociological problems, and great care must be taken so that the young physicists get the credit for their important contributions. But the view that there is no room for new ideas and initiative in large experiments and that the many talented scientists all move in lockstep toward a single goal is simply wrong.

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Flam's article presents a rather one-sided picture of the dynamics of large collaborations. Perl's discovery of the tau particle came about exactly because he was embedded in a group which at the time was very large! There is no less room for creativity within the Collider Detector Facility at Fermilab than there was in Mark II. The data stream is enormous, and it has been demonstrated that small groups or even individuals can mine that stream with great creativity.

There is yet another aspect of these collaborations not mentioned by Flam. In the old days that Schwartz describes in the article, a student could work at a small machine with a professor and maybe one or two other students. His exposure would come from presenting a paper at an American Physical Society meeting, perhaps only once. Contrast this with a large collaboration where the work in progress is reported every 2 weeks. When a student or postdoc presents his work, it will be heard by members of maybe 30 of the top institutions in the world. In addition, there are talks, as before, at the high energy physics conferences. Sources of help and criticism are much broader, and the student is exposed to a much greater spectrum of co-workers. Indeed, the best of the students and postdocs from CDF are now moving into tenured spots at top universities, which indicates that their work is well recognized.

I do not agree with Schwartz's suggestion that we need a new breed of physicist called "detector builders." In the 1970s, after strong focusing was invented, we first saw a split of this type. There were the accelerator builders, the bubble chamber builders, and a vast army of graduate students who only knew how to run the TVGP and SQAW reconstruction programs! Fortunately, the modern collider has closed this gap by entwining the detector and machine so completely that physicists are, once again, working and talking with each other. Students get well-rounded experience and have contact with many different types of experts.

We are entering a new era of physics, and there are problems with the large groups. CDF, with 400 members, is at a size where the democratic process can still function. I think the SSC detector groups will have to evolve new ways of coping with the problem of individual creativity as opposed to the discipline required by a detector that is well integrated and must be maintained for a long period after the original subcomponent builders have moved to other projects or as upgrades. I do not believe it will be an impossible task. The idea that these detectors will be manned by groups of a 1000 physicists in "lockstep" with no exposure of their individual contributions is ridiculous! I wonder if Schwartz has ever been able to get even *two* physicists in lockstep!

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Corrections and Clarifications

In the Research News article "Pot, heroin unlock new areas for neuroscience" by Marcia Barinaga (18 Dec., p. 1882), the diagram of the molecule anandamide on page 1883 was incorrect. The correct structure appears on page 1948 of the issue, in figure 1A of the report "Isolation and structure of a brain constituent that binds to the cannabinoid receptor" by W. A. Devane *et al.* (p. 1946).