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I believe that universities contribute a disproportionate number of transformational ideas because universities are structured differently from national labs in not having top-down management, not having a definite mission, continuously starting from the beginning with a fresh batch of students every year, and having faculty continuously exposed to first principles from having to teach. The labs have a hierarchical management, a lot more bureaucracy and rules, much larger overheads, a predisposition to do things in an expensive way, and the ability to self-promote that is the nature of a large organization. This is all appropriate for a large project where the basic concept has already been established and agreed upon, a large-scale version is required, and the capability to manage a large project is essential. Thus, I feel that labs are designed to do big, well-defined projects that universities cannot do whereas universities are designed to educate and open up new frontiers.

Labs do not generally let beginners make mistakes whereas universities do. The permission to make mistakes is essential to the development of new ideas. Several labs are now being run as for-profit entities which is antithetical to the idea of letting a novice start from scratch, make mistakes, and then reach maturity. A for-profit entity is also not going to give priority to discovery science. Universities do not get paid for their most important product, namely their graduating students who have had much value added by their educational experience.

When students are at labs they typically are given a minor role in a big project rather than have ownership of their own start-to-finish project (some exceptions exist). The time-scale for development of large projects is slower and typically not compatible with the time-scale for student to do a PhD.

Obtaining fusion aside, plasma physics has the special feature of not having an intrinsic scale so there are many useful areas that can be explored without the need for a large project.

I think it is appropriate for some students to be at labs, but feel the majority should be at universities.

Universities provide expertise external to labs. If there were no university scientists, there would be nobody to review what is happening in the labs and to provide outside advocates for new large projects at the labs.

The size of single investigator grants at universities is about half what it was 20 years ago in inflation-adjusted dollars so now the typical grant can only support a student salary, one month of faculty salary, and a little travel. The grants are generally too small for substantial new equipment or new initiatives. The result is that an investigator has to spend much more time writing proposals, progress reports, and final reports than 20 years ago. The reporting burden for each grant has also increased significantly as every year there are new rules and mandates and much more time is spent responding to these than in the past. The responsiveness of grant agencies to proposals has become slower and slower.