Brian Crawford on Life Sciences

Several exciting things are happening in life sciences. We are using laser-based flow cytometric methods to separate chromosomes from mammalian including human, genomes. DNA from these isolated chromosomes can be cloned by recombinant DNA methods, allowing studies of the basic structure and functional organization of the chromosome. Los Alamos is one of perhaps three labs with the requisite expertise in biophysics and molecular biology to perform this work, and recent NIH [National Institutes of Health] funding to establish a Flow Cytometry National Resource is fostering progress in this area.

We are also working on cellular oncogenes. These genes are thought to control the evolution of the normal cell toward malignant change. The isolation, that is, the cloning, of such genes by recombinant DNA methods and the reinsertion of these genes into normal cells, by a process known as DNA-mediated gene transfer, permit us to study how specific oncogene expression can result in cancerous change. We are also studying the role that gene rearrangement, which can result for example from chromosome damage, can play in the initiation and progression of cancer. This work relates to DOE concerns regarding the effects of both ionizing radiation and the by-products of fossil-fuel development and consumption.

Another exciting development is the establishment of an NIH-funded DNA sequence database in the Theoretical Division. Sequencing, or decoding, of the genetic code in cloned fragments of DNA is meaningful only if such information can be stored, retrieved readily, and analyzed. Just consider for a moment that each mammalian organism expresses on the order of fifteen thousand distinct genes in a cell—not to mention that each cell has DNA encoding for an amount of unexpressed information hat is several orders of magnitude greater. Software development for the analysis of the stored sequences will be pursued oncomitantly with this Herculean bookkeeping effort. ■

things and attempting to improve the codes both in X Division where we do theoretical weapons design and in T [Theoretical] Division. We do interesting work. and I find it kind of sad that we can't tell everybody about it. Clearly we could do better if we could talk to people.

BAKER: Do you find it difficult to get rewards from your work because you can't talk with more people about what you do, can't publish results?

HOWE: In some sense your ideas are rewards in themselves. If they work, you know you have made a gain, perhaps even contributed to unclassified scientific efforts like inertial confinement fusion, which is also being studied in our division.

SCIENCE: *Is it difficult to pick up information you need because your problems are classified?*

HYMAN: I really think it is. It is frustrating on all sides not to be able to express an interesting scientific question in the context where it arises. You notice the difference at national physics meetings between the typical scientist and those working only on classified problems, The ones working on unclassified problems can go to the blackboard and describe everything in minute detail, get immediate feedback, and also know that people will go home and continue thinking about the problem. When people first come to X and T Divisions. they continue to go to physics conventions as they did before. But if they work only on classified problems, often within the first few years their attendance drops off very fast. Some just stop attending national meetings and interacting with the outside world.

At the Center for Nonlinear Studies [CNLS] we are trying to encourage interactions between the classified and unclassified research areas by organizing mixed workshops. In these workshops the first two or three days are unclassified and uncleared university scientists are encouraged to attend and speak. On the last day classified questions related to national security are addressed, and the attendance is limited. The last such conference was a joint X-Division/CNLS workshop in February on interface instabilities.

A problem we have not been able to overcome is that numerical results generated by a classified code are classified-even when the physics model, the data tables, and the numerics used in the run are unclassified. This restriction greatly inhibits interactions with computational physicists outside the Laboratory.

SCIENCE: *How open is the communication between T and X divisions ?*

HOWE: We rely heavily on our communication with T Division people.

HYMAN: Mostly it's between people you've worked with for years or know from the coffee machine. And the interchange is more limited now that the two divisions have been physically separated. We are trying to get more joint seminars so that we can indeed hear what people doing unclassified research learn in the outside world and then relate it to our needs.

HECKER: It is a poor substitute to have to depend on T Division for your information.

HOWE: It doesn't really work.

SCIENCE: *Is an effort being made to change the situation?*

HYMAN: Yes, there's been a change in the attitude of management.