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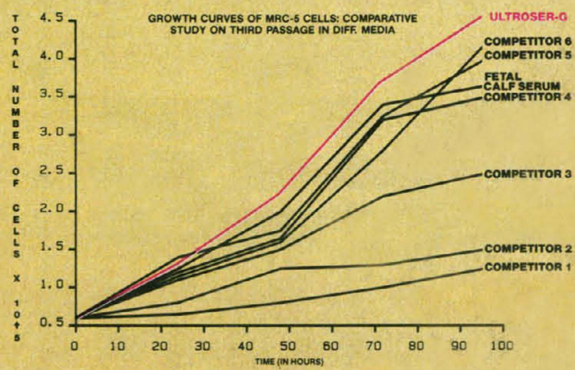

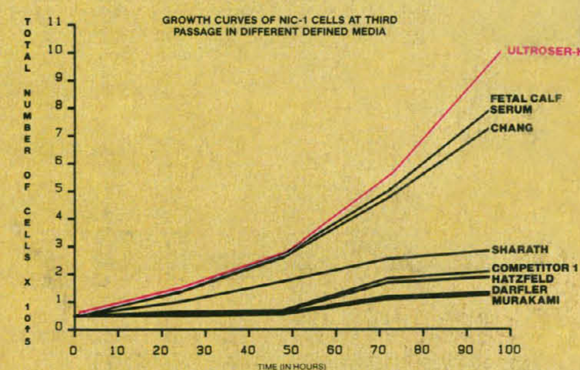

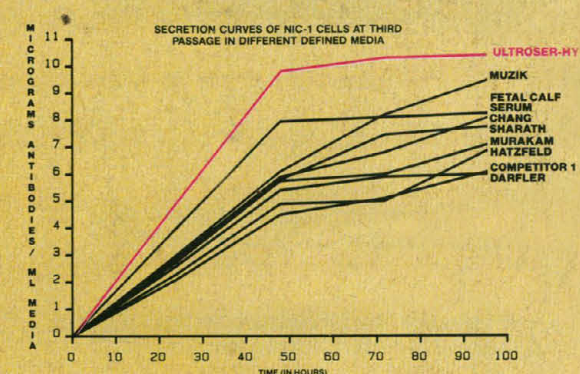

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This Week in SCIENCE

Climate changes and extinctions

SOME extinction events that have occurred in the earth's history could have been caused by abrupt climate changes in an otherwise slowly evolving climate system (page 996). Crowley and North review the theoretical support—in models—and the empirical evidence—in the geologic record—for abrupt climate changes and conclude that terrestrially driven processes (for example, plate movements) may sometimes have been responsible for these changes. A comparison of the times in earth history when steplike climate changes have occurred and the times of extinction events shows a number of correspondences: two striking examples are the extinction events of the Late Ordovician (440 million years ago) and the Late Devonian (365 million years ago), when an ice-free earth became glaciated. For other events, such as the mass extinction at the Cretaceous-Tertiary boundary, the evidence for a climate change is less compelling; other explanations (such as impact by a comet) must be found to account for the extinctions.

Signal transduction

MANY oncogene products appear to participate in the signaling that takes place between and within cells (page 1010). External stimuli interact with membrane receptors, various transducers carry signals through the cell, and eventually the signal arrives at the nucleus where proteins can induce, inhibit, or alter gene expression. Rauscher *et al.* describe some of the links in one such chain of events in which two cellular proto-oncogene products interact with each other and then associate with a specific control site on DNA. The proto-oncogenes c-*jun* and c-*fos* and their protein products Jun and Fos were induced with one of two very different external stimuli, serum and a calcium ionophore. Biochemical analyses established that June became a major constituent of the Fos complex; the congregate then associated with sites on DNA to which other transcription activators have been known to bind. Fos may thus exert its oncogenic potential by coupling of external stimuli with expression of genes that deregulate growth.

Forest decline

PARTS of Germany's Black Forest and a number of red spruce forests in the northeastern United States have been growing poorly and dying back (page 1017). The affected forests stand in acidic soils, and the trees are suffering from a calcium deficiency that Shortle and Smith attribute to inhibited calcium uptake: aluminum, which dissolves in the low *p*H soils, competes with calcium for the fine root binding sites. Calcium is the fifth most abundant element in trees and, when it is deficient, the formation of sapwood (through which water is transported and where food is stored) slows; this can be seen in the narrowness of the tree's annual rings. Poor sapwood growth means poor growth of the tree's crown and, in older trees, parts of the crown may be shed and the tree's vulnerability to diseases and insect infestations may be enhanced. It is not known why the soils in these locations are so acidic, but it is clear that air pollution and acid precipitation are helping to push the balance in the forests toward the cascade of events that leads to calcium-deficient trees.

Alpha particle immunotherapy

AN α-emitting "magic bullet" that cures mice of ascites tumors is described by Macklis *et al.* (page 1024). The therapeutic reagent is a complex of radioactive bismuth (^{212}Bi) and a monoclonal immunoglobin M antibody specific for the tumor cells. The ^{212}Bi antibody kills tumor cells in vitro. When it is injected into mice intraperitoneally, it brings about local, focused killing of tumor cells within the peritoneal cavity. The α-particles have high energy, work only at short range (within a few cell diameters), and are extremely toxic; the damage they inflict is not readily repaired by cells. The reagent has a short half-life (just over an hour) and is slow to leave the peritoneal cavity because the antibody is so large; thus there is minimal cytotoxicity for bone marrow and other cells outside the peritoneal cavity. Immunotherapeutic reagents based on this design are likely to be of use for treating human tumors, especially those of the peritoneal cavity in which micrometastases develop and many of the tumor cells are accessible for reacting with cytotoxic antibodies.

Macrophages in transplanted kidneys

INNOCENT-bystander macrophages carried along in a transplanted kidney are in large part responsible for eliciting an immune response in the recipient; such a response may lead to rejection of the transplant (page 1032). Following up on the observation that the kidneys of animals fed a diet that is low in essential fatty acids have fewer resident macrophages, Schreiner *et al.* used fatty acid–depleted kidneys in successful transplantations between rats of different histocompatibility types. Acceptance of the grafts did not require immunosuppression of the recipients, and the kidneys functioned well and were quickly repopulated by host macrophages. This experimental system can be used for exploring details of graft acceptance and rejection, for discovering how macrophages come to populate kidneys, and for investigating how resident and passenger cells interact within this organ.

The bottom lines

Among the chemical reactions that are thought to contribute to ozone loss and the formation of the Antarctic ozone hole are some involving dinitrogen pentoxide (N_2O_5); the predicted reactions have now been shown to occur under experimental conditions that simulate conditions on polar stratospheric clouds (page 1018).

AMBIS screen image of 2-D gel analysis of ^{35}S-labeled whole cell proteins from murine Swiss 3T3 fibroblasts. Number in second box from bottom of screen, 1491, indicates quantitation of radioactivity in calmodulin. Courtesy of Herbert L. Cooper, National Cancer Institute.

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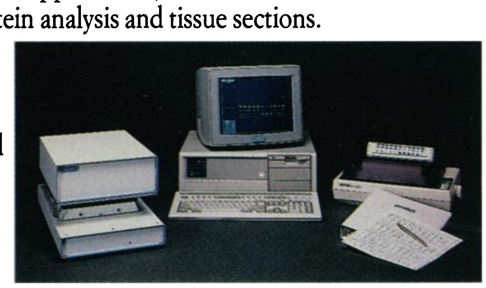

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Setting Priorities in Science

The paths of Big Science and big federal deficits have finally supercollided as science expands and the discretionary part of the federal budget shrinks. We are approaching a zero sum game. It is significant, therefore, that National Academy of Sciences President Frank Press and Association of American Universities President Robert Rosenzweig have each called on scientists to set priorities among disciplines, a subject heretofore considered inappropriate for mention in polite scientific society. The question remains as to how this is to be done.

Many individuals will come forth to proclaim personal priorities, but how can we produce a list that will have credibility both inside and outside the scientific community? The first steps might be to select about 14 individuals with diverse backgrounds who would form a Panel for Science Priorities, operating like such panels at the National Science Foundation and the National Institutes of Health. The members should represent the physical, biological, and social sciences. To achieve credibility, the representatives of the various disciplines should be selected by the appropriate societies—for example, physicists by the American Physical Society, chemists by the American Chemical Society, and so forth. In that way, the criticism that the outcome was predetermined by selection of lions from some disciplines and lambs from others should be avoided. The societies should show the good judgment to appoint wise enthusiasts rather than provincial chauvinists, because willingness to see other points of view would be essential to the success of the panel.

The panel should then give priority ratings to the proposals of Big Science in precisely the same way that panels now consider proposals for Little Science. Each proposal should contain an appropriate budget and arguments about feasibility and significance of projects, both to science and to society. To put these proposals in perspective, each discipline should be charged with putting together a document outlining the effects of a 10% increase and a 10% decrease in funding for the Little Science of that discipline. The priorities panel would then be charged with ranking the order of the proposals for the space shuttle, the genome project, the NSF centers, the 10% increases, the 10% decreases, and so on.

The ground rules of such a system would have to be similar to those of the present granting committees for Little Science—that is, it would be known in advance that subsequent supplemental budget appropriations would have essentially zero chance of being approved. In that way, program proponents would have to present realistic budgets, or be faced with a future half-finished project. Little scientists may not incur cost overruns; neither should Big scientists.

Congress would of course not be mandated to follow the recommendations of the scientific community, because factors such as national prestige and relative values of other parts of the budget would have to be assessed. However, a priorities panel would at least provide the considered judgment of the scientific community. Moreover, it might suggest to the Legislative and Executive branches that they establish equivalent panels on federal priorities to aid them in comparing the demands of farmers, transportation experts, the military, education, the environment, et cetera. A panel composed of congressmen and Executive Branch representatives, specifically asked to rank incremental increases or decreases for science, farmers, health care, and so on in a priority order would have the virtue of introducing rationality into the budget process. Some will say this is utopian. But the automatic features of the Gramm-Rudman-Hollings Act indicate a strong desire by Congress to deflect the blame for tough budget decisions away from those who must get elected every few years. The priorities panel would allow congressmen to say to constituents, "We set up a panel to introduce reason into the budget process."

It has been said that a democracy will always come to the right decision once it has exhausted every other alternative. The two key features of scientific panels—that is, having a range of experts and the requirement to rank proposals in relation to each other, rather than ad hoc, are crucial tools that have maintained the quality of science. They are clever social devices that can be extended to the new, more difficult tasks of interdisciplinary and intercultural assessments. Such devices will not only help in setting priorities but, as anyone who has filled out a grant proposal knows, will actually improve the hard thinking on which the success of the proposal depends.—DANIEL E. KOSHLAND, JR.

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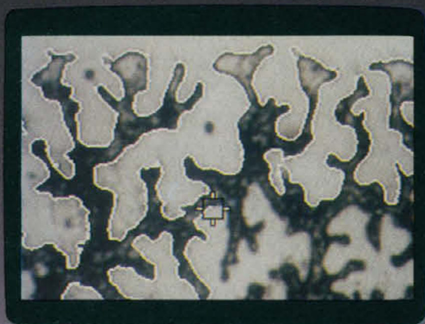

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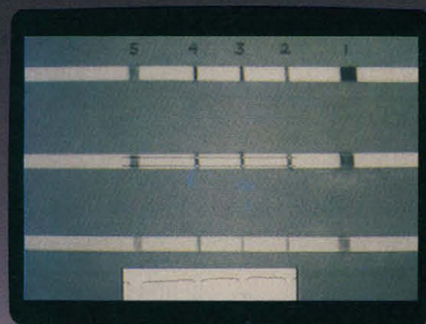

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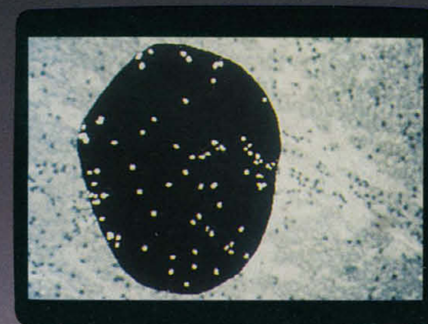

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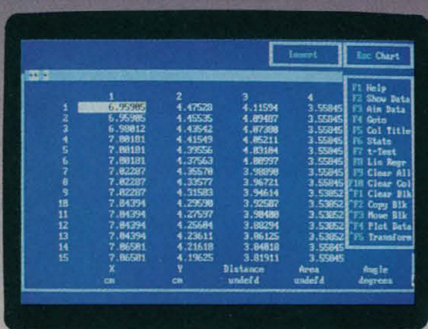

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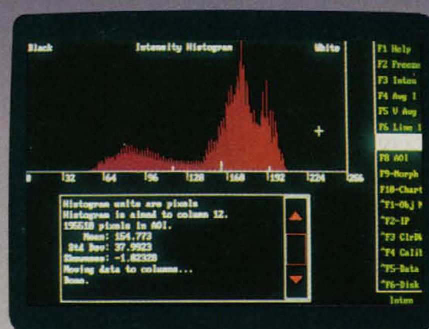

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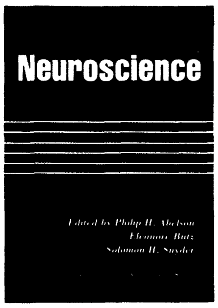

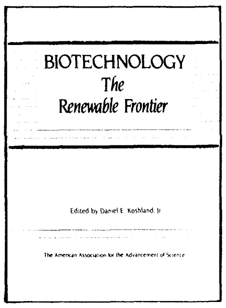

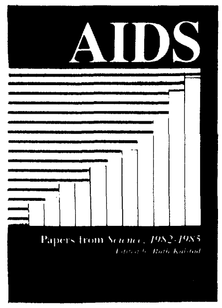

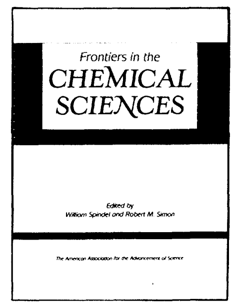

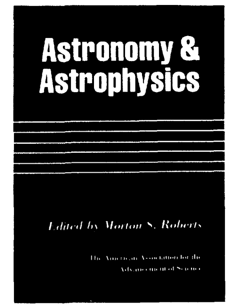

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