27 November 1992
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Exploring the questions of science and education for the future is the theme of AAAS’93 in Boston from 10 to 16 February 1993. The program of scientific sessions spans the sciences, highlighting the year’s advances and speculating on tomorrow’s discoveries. A special symposium focuses on educational programs that aim to elevate scientific literacy and train young scientists to find answers for the future. See page 1511 for a complete program and registration information. [Photo: Darrow Montgomery; taken at Jessie LaSalle Elementary School, Washington, DC]

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1494 Stochastic behavior of glutamate receptors

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Indicates accompanying feature

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A Campaign for Science

Science. Dr. Notall, you are one of the international experts on election campaigns, the man who managed Harry Truman's campaign, the man who arranged the Lincoln-Douglas debates, and the man who got Moses all that favorable publicity in the Bible.

Notall. A vast understatement of my true worth.

Science. Are there any lessons from the recent campaign that might be transferred to science and science publishing?

Notall. Of course there are. For example, politicians have learned the advantage of double, triple, and quadruple publication. None of this nonsense of one paper in one journal only. You repeat your message in Boston, Dallas, Terre Haute, and Sacramento until everyone gets so bored with it that they think it's a fact.

Science. That might cause some problems for scientific publication.

Notall. That's your typical stygoid response that will prevent science from ever being in prime time. A second innovation would be references. You will note that news stories of the election all reported information from "insiders," "foreign policy experts," "economic experts," or, in cases of extreme importance, "a high official." This kind of uncheckable reference has great advantages over the mind-numbing data of modern science.

Science. Did you notice any novel ideas on the moral front?

Notall. Science should, of course, come out for something like "traditional science values," which would solve a lot of the debate over ethical issues. Traditional science values should be defined as those principles on which all scientists agree, and any deviation from those principles will be considered to be unacceptable and morally corrupt.

Science. What do you mean by deviations?

Notall. Good examples of deviation from accepted values are fraud, plagiarism, and highly original ideas.

Science. And do you have any ideas for improvement in scientific publication?

Notall. The anchors on television are a close analog to the editors of scientific publications. And you will note that they never let presidential or other candidates finish a speech, or even a sentence, before they explain to the audience what the poor idiot is trying to say and whether he or she is sincere or just trying to get the Oklahoma vote. Editors should be allowed to insert sentences of clarification within authors' articles and to write little introductions and conclusions on the sincerity of the authors. That is more readable than scientific details.

Science. What about plans for the future?

Notall. Plans for the future are "pie-in-the-sky" if it's an unlikeable author and "sticking to the issues" if it's a likeable author. A lot of wasted time on data and experiments could be eliminated if authors were allowed to say what they intend to do and wrote results they thought were likely, rather than bothering to go through all the experiments. Authors would be allowed to promise that if they get published, they are planning to get the data for a Higgs boson or a cure for cancer. Good intentions should be considered far better than past history, such as experiments.

Science. What kinds of behavior should disqualify authors?

Notall. Clearly, any past character deficiencies or guilt by association should be enough to disqualify an author. It is of course disgraceful that the entropy of the universe has been increasing for years without any imaginative ideas on how to decrease it. And the second law of thermodynamics by preventing perpetual motion machines has an abominably regressive effect on growth. Anyone identified with these notions should not be allowed to publish. Scientists who change their minds are reprehensible. Sticking to one's old ideas regardless of new facts shows steadfastness of character. Change for change's sake is also highly desirable. These principles are somewhat contradictory when expressed together but are very valuable for decision-making if considered one at a time. Selective use of mutually exclusive moral positions allows one to publish nice authors and reject unpleasant authors on principle.

Science. Do you think these campaign ideas will actually help scientific publication?

Notall. Eliminating references and data will, of course, decrease the difficulty of publishing scientific research, which should mean that the literature will increase astronomically, giving the illusion of productivity. Of course, what is published won't amount to much, but it won't require a tax increase either.

Daniel E. Kosland, Jr.
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mitotic cells of the telencephalon have intrinsic regional properties that foreshadow prospective cytoarchitectonic areas, but does not exclude the role of extrinsic factors in cortical paellation. In fact, the article cited by Shatz (1) provides the first and, so far, the most dramatic experimental evidence that the border of area 17 can be shifted significantly when the size of geniculo-cortical input is reduced by prenatal manipulation (1, p. 174 and figure 7). More recently, we confirmed this by showing that the size of thalamocortical input is directly proportional to the size of the cortex (2). Thus, a cortical protomap provides developmental constraints on the outcome of the interplay between cortical cells and their input from extracortical sources. The prefix "proto" in the term "protomap" was introduced to emphasize the primordal, malleable character of the developing cortex. I should not be associated with a strict determination of neural connections, as the phenomenon of initially diffuse thalamocortical projections sharpened by selective elimination was described in my laboratory, followed by experimental evidence that these competitive interactions begin prenatally (3). What I suggested is that the species-specific pattern and cellular characteristics of cytoarchitectonic areas cannot be determined exclusively by extrinsic sources or by neuronal activity and that there must be some intrinsic regional differences within the embryonic telencephalic wall, including possibly the transient ventricular and subplate zones (4). It is rewarding that the tools of molecular biology are now beginning to supply new lines of evidence for regionally restricted expression of molecules and genes within the telencephalon before or independently of thalamic input (5), thus supporting the basic tenet of the protomap hypothesis. I agree with Shatz that it is an important and challenging subject in developmental neurobiology and that more research needs to be done on both genetic and epigenetic regulation of cortical development.

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REFERENCES AND NOTES

Protection from Dementia

We wish to comment on the controversy over the role of β-amyloid deposition in Alzheimer's disease (News & Comment, 4 Sept., p. 1336) and particularly the suggestion that glutamate hyperactivity or altered energy metabolism may be a determinant of the extent to which such deposition is harmless. We have evidence (1) that the disease is characterized by glutamate hypoactivity with the capacity for energy metabolism maintained. Thus two abnormalities (excessive glutamate and energy depletion) that can interact with β-amyloid to destroy neurons in culture may not occur in the brain of patients with Alzheimer's. The development of neuroprotective agents will depend on a greater understanding of the function and mismetabolism of amyloid precursor proteins (APP). Processing pathways of APP appear to be affected by a muscarinic agonist (2) and phorbol esters (3) which mimic the transduction pathways of neurotransmitters that use phosphoinositide breakdown as a second messenger. Hence an additional rationale for some transmitter-based therapies is emerging. In Alzheimer's disease circum-

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scribed loss of cortical glutamatergic pyramidal neurons occurs, leading to reduced excitatory input to the remaining cells. This is compounded by reduced excitatory cholinergic modulation. γ-Aminobutyric acid interneurons are preserved, which suggests that inhibitory tone is maintained and perhaps increased. Functional sparing of serotonergic innervation may occur and maintain a negative modulatory effect through serotonin 1A receptors. Therefore, approaches that improve the efficacy of the remaining glutamate transmission may be useful. This improvement may be achieved by action on receptors of cortical pyramidal neurons with agonists (muscarnic receptors), partial agonists (for example, D-cycloserine in the case of N-methyl-D-aspartic acid receptor complexes), or antagonists (serotonin 1A receptors). Drugs that affect transmission are an important goal, as they will be required for most patients if functional disabilities already present are to be improved or reversed. They will also be required for all patients with Alzheimer's disease during the development of prophylactic agents (1).

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REFERENCES

The Progress of Science

The instrumentation issue of Science (25 Sept.) prompts me to the following thoughts. New machines to power scientific inquiry to higher levels of sensitivity and resolution are detailed to fascinate and excite, but in the end, this tech junkie is left with the sad reality that most of them will be unattainable. Having just completed another masochistic session on a National Institutes of Health Shared Instrument Study Section, I find the contrast between the great opportunities for inquiry afforded by the instruments discussed in Science and the limited funding provided by the government to acquire these expensive tools is remarkable. There can be no doubt that technology is the engine for scientific advance. This is not to demean the importance of a good idea, but it is the quality of the scientific tools that raises the level of the questions and the efficiency of the experimental approach. The lack of a vocal constituency for shared instrument funding has made it the target of choice for removal from the appropriations request menu supplied to Congress. This results in the type of financing strategies that fund five equipment requests from 60 submissions. It should be stated that each instrument grant is usually submitted by from four to ten investigators whose individual research programs would greatly benefit from better analytical tools. Each of those investigators has postdocs and students who would learn these new approaches and then be educated to ask more sophisticated questions about their problems.

Our students and research programs will go on in the absence of such equipment, but the scientific problems we face will not become less complex because of a lack of funds or a commitment to provide the technical means to unravel them.

Melvin Schindler
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1993-94
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1991 Jozsef SZEJTLI, Cyclolab, Hungary
1992 Nicolas FRANCESCHINI, CNRS Marseille, France

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represent both the effluents of affluence (industrial production and automobiles) and those of poverty (burning tropical vegetation). Although there are still some who question that the observed temperature rise is a result of the increase in greenhouse gases, several global circulation models (GCMs) predict that a doubling of preindustrial CO$_2$ concentrations will cause an overall average warming of 1.5°C to 4.5°C or so within the next century.

The effects that such a warming trend will have on agricultural production and coastal regions have received much discussion. The primary goal of this book, which emerged from a symposium on the topic in 1988, is to focus attention on its impacts on biological diversity and natural ecosystems. To this end, the editors have brought together a stellar assemblage of authors. Following a foreword by Michael Soulé and a preface by Thomas Lovejoy, Robert Peters provides overviews of the problem from two different perspectives. George Woodwell follows with a revealing chapter on government attitudes to the climate change problem, and Stephen Schneider and coauthors discuss the general conclusions—and deficiencies—of present GCMs.

The next section, with chapters by Thompson Webb and Russell Graham, describes the impacts of past climate changes on the world's biota. This is followed by reviews on the effects of climate on vegetation (Ian Woodward), soils (Walter Whiteford), wildlife diversity (Herman Shugart and Thomas Smith), animal physiology (William Dawson), ecology (Richard Tracy), behavior (Daniel Rubenstein), and migration (P. J. P. Myers and Robert Lester), and parasites and diseases (Andrew Dobson and Robin Carper).

How might global climate change affect specific regions? Vera Alexander provides informed speculation on arctic marine ecosystems, Carleton Ray and coauthors on coastal marine zones, Gary Hartshorn on tropical forests, and Dwight Billings and Kim Moreau Peterson on the arctic tundra, Jerry Franklin and coauthors on the northwestern North American forests, Walter Westman and George Malanson on the Mediterranean ecosystems of California, Dennis Murphy and Stuart Weiss on the Great Basin, and Larry Harris and Wendell Cropper, Jr., on Florida. Potential changes in eastern North American forests are treated in papers by Daniel Botkin and Robert Nisbet and by Margaret Davis and Catherine Zabinski. Finally, indirect linkages and synergisms among climate change, biodiversity, the geosphere, and various anthropogenic stresses are addressed in contributions by Norman Myers and John Harte et al.

What do all these papers tell us? First, all predict that the consequences of global change for biodiversity will be dramatic and disastrous. Many ecosystems will be fundamentally altered as a result of changes in abundance and local extirpations of more common species, extinctions of geographically restricted species, expansion of exotics and disease vectors, increases in catastrophic storms, fires, and seasonal extremes, and unknown interplays among all these events. These in turn are likely to result in irreversibly losses of germ plasm, reductions of forest yields, and declines in the quantity and quality of freshwater resources. Clearly, such impacts not only will alter natural resources but also human economic futures.

Aside from providing "creative speculation" on the qualities of a changing world, few of these papers are able to make specific, unequivocal predictions. The complexities of the real climate system still vastly exceed the comprehensiveness of today's GCMs, and the grid size of these models is too large to predict local conditions very accurately. Climate can affect almost every conceivable aspect of plant and animal biology, so we have only rudimentary ideas about how species' tolerances may respond to climate change. We know even less about how the loss of species can affect basic ecosystem processes. While we do know a bit about the relationship between past climates and community composition, extrapolation to the future from this information is risky. The rates of change are likely to be much faster than previous onsets of natural greenhouse conditions, and the flora and fauna must respond to this change in landscapes highly modified and fragmented by human activities.

The most serious consequence of our current inability to generate specific predictions is that it provides a grand excuse for continued inaction. As Woodwell points out, the "concept of a large and resilient world open to infinite compromise persists." However, the take-home lesson from this book is that the changes likely to be wrought by global warming are not going to be very convenient, pleasing, or profitable to its human inhabitants and that the time available for altering its course is growing short. The prudent action is to follow Woodwell's advice and take immediate steps to "restabilize the human habitat and preserve opportunities for our children to live in." Perhaps the first step is to buy this book and give it to your favorite politician for Christmas.

**Vignettes: Divine Terminations**

Saddam Hussein had styled himself the heir of Nebuchadnezzar and Hammurabi, but, in truth, he was a modern-day Sennacherib. . . . [Sennacherib] invaded Judea and besieged Jerusalem. Like Hussein, his forces were shattered by air power—allegedly suffering 185,000 dead at the hands of the Angel of Death.

—Richard P. Hallion, in Storm over Iraq: Air Power and the Gulf War (Smithsonian Institution Press)

The direct influence of prophecy belief on nuclear decision making surfaced as an issue in the 1980s as the eschatological interests of several Reagan-administration officials became known. Secretary of Defense Caspar Weinberger, asked about the subject in 1982, replied, "I have read the Book of Revelation and yes, I believe the world is going to end—by an act of God, I hope—but every day I think that time is running out." Interior Secretary designate James Watt, questioned at his confirmation hearing about preserving the environment for future generations, forthrightly replied, "I do not know how many future generations we can count on before the Lord returns." Reagan's Surgeon General, C. Everett Koop, attended a 1971 prophecy conference in Jerusalem and reported on it for a leading premillennial journal.

—Paul Boyer, in When Time Shall Be No More: Prophecy Belief in Modern American Culture (Harvard University Press)

**Books Received**


