LETTERS

Two Disciplines

Gerald M. Edelman touches on important issues in his editorial "Scientific quests and governmental principles" (9 Apr., p. 99). He makes some good points, but also some not-so-good ones. What moves me to overt disagreement is the following argument as I understand it. The politico-legal and the scientific disciplines are distinct, different, and "rarely intersect." This leads them (and presumably their followers) to extreme and antagonistic ideological positions that are "dangerous as well as erroneous." These cannot be fully understood or resolved until we understand "how the brain itself produces thought and language."

My unpremeditated reaction is that we risk first experiencing a cold day in Hell if we must await that achievement. I am not pessimistic about the capabilities of the neurosciences, although the task Edelman sets is no mean one. I am more influenced by the dire social conflicts that are already upon us and that are now consigning many lives daily to whichever postulated ultimate fate. The travail of the Irish and the Lebanese, for example, is almost purely within the politico-legal "discipline," if that includes the religious. With "politico-legal" conflict everywhere rising and value-driven fire storms threatening, we can hardly wait to "know better how the brain works."

Actually, cognitive and normative knowledge processing each have a constructive tradition and a long history of interaction. The practitioners of one far from always disagree with practitioners of the other. Edelman wisely urges a greater mixing of the two. It is only through a combination of the best in both traditions that real progress can be made. In fact, we need more effective incorporation of knowledge from all constructive traditions into decision-making; existing mechanisms at the social level are failing to provide it. Whatever the relation of agreed-upon facts and not-agreed-upon values in the mechanisms of the brain, there will remain the *social* problem of accommodating many behavioral streams into a not too disharmonious ensemble. Despite the advantages and attractiveness of greater knowledge of mechanisms in the brain, we can't wait nor can we give all our energies to contemplation of even a neuro-navel.

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Of course, scientific and normative approaches to human knowledge have a long history of interaction. But in modern times, there are peculiar difficulties of understanding that have become particularly crucial with the increasingly rapid societal adoption of scientific technology. Grobstein and I apparently do not mean the same thing by "interaction." I mean acts or decisions based upon a *mutual* understanding of the limits of both scientific and legal disciplines. It is this understanding that I feel should be encouraged among practioners of science and of government.

Much of Grobstein's letter is inspired by his mistaking my suggestions for fuller resolution of ideological conflicts that arise from a failure of this understanding. I did not propose or imply by these suggestions a moratorium on practical or pressing goals. Although I still recommend deepening our knowledge of brains and language, I am astonished at his inference that this reflects an unconcern for our present historical agonies.

It is always tempting to impute a lack of common sense or of moral concern to those who suggest long-range approaches to important social matters. While sharing Grobstein's moral concern, I do not feel that looking for the physical bases of thought and language will distract us from our moral duties, nor do I suggest giving *all* our energies to the task. In any case, I am not as sure as Grobstein that one can predict how long a fundamental answer to this key problem of neurobiology will take. Although knowing how the brain works will not solve our moral dilemmas, it will, I think, prevent us from adopting egregiously stupid ideologies. And possibly, it may suggest some epistemological limits to apply to both cognitive *and* normative matters.

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Ice-Age Vegetation

In the otherwise excellent CLIMAP (*1*) survey "The surface of the ice-age earth" (19 Mar., p. 1131) an ambivalent description of land surface properties is shown in figure 1. Vegetational equivalents of albedo estimates in places seem to contradict geological data established by pollen analysis and dated by radiocarbon.

This is especially true for category E, described in the figure legend as having an albedo below 20 percent and com-

posed of forested or thickly vegetated land. It dominates much of the United States, Central America, Brazil, northwestern Europe, equatorial Africa, India, China, Indonesia, New Guinea, and Australia. It is well established that within the lands listed above there were large areas of rocky deserts, tundra, prairie, or lightly vegetated savanna. While an albedo below 20 percent may apply to such surfaces as well, the caption may mislead the reader and give the impression that unglaciated land was mainly forested.

Because of decreased ocean areas, as well as water temperatures, an almost worldwide drop in Pleniglacial precipitation is indicated by both theoretical studies and field observations (*2*). This should be a key factor in long-term climate prediction. For a number of areas ranging from central Africa to northern Australia there has already been a reduction of precipitation on the order of 50 percent within the last 3000 years (*3*). With the aid of Landsat photography, it would appear to be highly desirable to plot accurately the area and directions of the vast late Pleistocene dunes that are today partly covered by vegetation. This would help provide an independent check for the general circulation models based on CLIMAP's valuable sea-temperature and albedo data.

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References

1. CLIMAP is an acronym for Climate: Long-Range Investigation Mapping and Prediction.
2. R. W. Fairbridge, *Nature (London)* **196**, 108 (1962); in *Problems in Paleoclimatology*, A. E. M. Nairn, Ed. [Interscience (Wiley), New York, 1964], p. 356; *Quat. Res.* **2**, 283 (1972); J. Williams, in *Quaternary Environments*, W. C. Mahoney, Ed. (Geographical Monograph, York University, Toronto, 1974), pp. 295–310.
3. E. M. Van Zinderen Bakker, *Palaeoecology of Africa* (Balkema, Cape Town, South Africa, series 1950 to present); A. Rapp, *A Review of Desertification in Africa* (Secretariat for International Ecology, Stockholm, Sweden, 1974); J. Bowler, paper presented at the Australian Conference on Climate and Climate Change, Melbourne, Australia, 1975.

The legend for figure 1 in our article could indeed be misleading, inasmuch as it does not clearly state that the land surface is classified according to its relative reflectivity while the reference to vegetational cover is made only to illustrate typical examples of surfaces possessing the corresponding albedo. The low reflectivity class (E) includes not only forests, green dense vegetation of tundras, prairies, and savannas but also dry shrublands on dark lateritic soils, or stony deserts with frequent varnish. Only the first two types of cover, which

were most abundant, were mentioned in the legend.

Reconstruction of the past vegetation was the first step in assessing the albedo values (*1*). Next, an estimate of the present large-scale albedo of a similar vegetational type on a similar soil was made using aerial albedo measurements (*2*) and relative surface brightness observed from satellites (*3*). It was assumed that the bare soil reflectivity 18,000 years ago did not significantly differ from that in the present, except for areas with fossil late Pleistocene sand dunes or loess.

We would appreciate all relevant information that could help us upgrade the present rudimentary map of the earth's surface 18,000 years ago.

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1. B. S. Vuilleumier, *Science* **173**, 771 (1971). A map of vegetation 18,000 years ago appeared in G. Kukla, *Nat. Hist.* **85**, 56 (April 1976).
2. E. C. Kung, R. A. Bryson, D. H. Lenschow, *Mon. Weather Rev.* **92**, 543 (1964).
3. Environmental Data Service, *Key to Meteorological Records, Documentation No. 5.327* (National Oceanic and Oceanic Administration, Silver Spring, Md., 1972); unpublished NOAA photographs.

Climatology Conference

The First Miami Conference on Isotope Climatology and Paleoclimatology (*1*) was held 16 to 22 November 1975, chaired by Cesare Emiliani and Willard F. Libby. Eighty-four scientists from ten countries attended and agreed on the following salient points:

1) Ice ages have been the normal condition during the last several million years, with temperate climates enduring only about 5 percent of the time.

2) Because the global food supply depends primarily on climate, current understanding of climate must be vastly improved in order to meet the challenge of tomorrow's food supply. We possess the methods and techniques to establish climate history and only a concerted effort is needed to do that.

The conferees agreed that, in particular, study of the climatic history of the past 10,000 years (the Holocene), using the isotopic record of marine shells, corals, foraminifera, and tree rings together with accurate radiocarbon dating and focusing on the occurrence of extreme climatic conditions, should be of highest priority.

Those attending also agreed on the importance of establishing the frequencies modulating climatic change during the last 1 million years, using cores from the world oceans and from marginal seas where high rates of sedimentation exist.

Also given high priority at the conference was the study of the geochronology of significant cave and lake deposits, using radiocarbon for dating and oxygen isotopic analysis for identifying climatic trends, plus study of (i) the evolution of polar climates through an expanded program of isotopic analysis of the Greenland and Antarctic Ice, and (ii) the rates of advance and retreat of the world's ice from 8,000 to 18,000 years ago, using radiocarbon dating and oxygen and deuterium isotopic analysis of closely spaced continental samples.

The participants found that a successful attack on the pressing problems of climatic change should encompass the use of all isotopic methods and the international cooperation of all isotope laboratories involved in climatic studies. They suggested an International Decade of Isotope Climatology Study, beginning with a close comparison of isotope standards, and the establishment of an Isotope Data Bank and an information center in Miami.

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References

1. Supported by the National Science Foundation, Eugene Bierly, monitor.

Hepatitis B Vaccine: Disclaimer

Witold J. Brzosco, a former research associate of mine at the National Institute of Hygiene in Warsaw, implies in a letter to the editor (7 Nov. 1975, p. 510) that our group directly participated in the development of a hepatitis B vaccine. I feel obliged to inform you that the National Institute of Hygiene group, headed by myself, has never been involved in the preparation of any hepatitis B vaccine or any hepatitis B virus materials meant to be used as a vaccine. While still working in our department as an independent researcher, Brzosco isolated and treated with formalin the hepatitis B surface antigen which he subsequently used for skin testing of patients at the Infectious Diseases Clinic of the Warsaw Medical Academy, where he is now employed.

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