Letters

Science: Philosophical Problems

Some anthropologists may wish to debate some of Bentley Glass's premises, in his article "The ethical basis of science" (3 Dec., p. 1254), concerning the evolution of human values. Indeed, the biologist part of my make-up twinges at his rather Lamarckian statement connecting the "loss of certain unnecessary structures, such as bodily hair once clothing was invented." The survival value of such a depilation is questionable; the evidence directly connecting human adoption of clothing with hair loss probably still more so.

Regarding the subjectivity of science, few would deny that scientists, as individuals, may be as subjective in their judgments as anyone else. There is also little doubt that science and scientists collectively may often be subjective. As Glass notes, such subjectivity is probably inescapable. The point, however, is not that the processes of science are or are not strictly objective, but rather that there must be a constant striving to make them so. Indeed, the cases of Lysenko and Nazi Germany cited by Glass are prime examples of what happens to science when group subjectivity is allowed to replace a goal of group objectivity. Glass's thesis that subjectivity in science is unavoidable and should be recognized is one which may help to prevent any such situation from arising in the future, for a science which welcomes such subjectivity is potentially as dangerous as one which fails to recognize the presence of subjectivity within it. . . .

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. . . I think a new dimension can be added to Glass's ideas by considering them in the framework of Pierre Teilhard de Chardin's theory of evolution (*The Future of Man*, Harper & Row, 1964). When viewed with Teilhard's perspective, Glass's fifth paragraph, upon which the rest of his argument is based, contains an unsubstantiated hypothesis.

I would argue that science is *not* the finest [instrument] yet developed in the evolution of any species for the malleable adaptation of man to his environment . . ." although it is an extremely important one which helps justify Glass's "commandments" to scientists. Man's environment includes his fellow man. I would argue that a finer instrument . . . for the malleable adaptation of man to his environment is love. The logical development of this idea, which Teilhard presents so ably from a scientific, philosophical, and theological viewpoint, leads naturally to Glass's "commandments," although it goes much further. Furthermore, Teilhard's comprehensive treatment of the role of science—knowledge—in man's progress avoids any possible implication that science itself is or ought to be the chief end of mankind, and at the same time fearlessly and vigorously defends freedom and truth, whatever its source.

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. . . Glass rightly discusses the subjective nature of much that may be interpreted as hard fact. . . . Fundamental are the problems of hidden assumption and inference that pervade all human judgment. . . .

The witch doctor can provide numerous "controls" to support the notion of his superpowers: after all, persons *can* be "boned" to death, and by only him among tribal members. We take issue with such explanations largely by proposing alternatives. But it also remains philosophically possible that rockets leaving Cape Kennedy do so through causes other than ones we infer from our initial assumptions.

Some questions, such as whether the blue we see is "really" blue, or the logical possibility of causal sequences operating in reverse order, remain forever in scientific never-never land. From the business end of things, these can usually be ignored. Other deceptively similar assumptions, however, may creep into the very tactics of research and thus be of considerable import. Evolutionary theory, upon which Glass dwells, provides a valuable illustration of certain potential problems. "Survival of the fittest" is a tautology, not an explanation per se, for it is through the operation of survival that "fittest" is defined. More important, perhaps, are unanalyzable statements which may follow, such as that man today acts (or should act) thus-and-so because of such-and-such in the past. Fossil records of behavior and individual struggles are difficult to obtain, much less evaluate in such a context. Statements of necessary and proper biological function often reflect little but uncritical assumptions as to adaptive value and overgeneralizations from limited data. Premature confidence that the answer is at hand, with perhaps subliminal fear that it is not, can lead to the arrogance of dogma and its potentially severe consequences.

The espousal of the theory of inheritance of acquired characters is a good example, cited by Glass, of such dangers. Certainly there is extremely strong evidence to suggest the validity of our own current concepts of heredity, from mathematical models of dispersion and repeatable segregation of discrete characters to the occurrence of such behavioral phenomena as imprinting, in which each generation must learn anew to follow particular objects. The main issue, however, is whether such debates should now be closed to further inquiry. Let us take a few particulars: Does it necessarily follow from the failure to transmit experimental mutilations (such as cutting tails off mice) that certain adaptive tendencies cannot be so transmitted? Can failure to transmit demonstrable altered morphological or physiological states be assumed to generalize to all other modes of action, for example, learning and behavior? Could failure to transmit specific tendencies necessarily disprove the possibility of the transfer of more generalized functions, such as timidity or fear in the presence of new stimuli? Can failure to demonstrate transmission of functions through nuclear mechanisms be safely generalized to eliminate change via other biological mechanisms? The pos-

sibility of cytoplasmic "holding" functions to carry a species through until a "chance" mutation arises, for example, does not appear to be experimentally discounted. (The day after I drafted this letter the report by J. Brun on "Genetic adaptation . . ." appeared in *Science* [10 Dec., p. 1467]. Whatever the conclusion of parapsychologists, the scientific results are encouraging!) Or, given the importance of mutation, can it definitely be said that environmental circumstances, for example stress, will not alter the rate of "random" change? The point to be made is that such inferences do not necessarily follow from the data at hand, and similar careless generalizations with their hidden assumptions may but replace one dogma with another. . . . The difficulty of evaluating scientific proposals comes in trying to balance the apparent probability of success with the conceptual importance of success if it does occur. To rate only the former is, and I think Glass would agree, "bad." Here indeed ethics and pragmatics merge.

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Von Neumann: Help Sought with Film

On the morning of Monday, 29 December 1952, John von Neumann gave a lecture on game theory at a meeting in St. Louis of the AAAS. The American Mathematical Society was also meeting there, and his talk had auditors from both meetings. Someone in the audience, identity unknown, tape-recorded this talk. Can someone help us locate the tape?

The Committee on Educational Media of the Mathematical Association of America is preparing a film on von Neumann's life and achievements. We are trying to track down this and other recordings and gather pictures and information about him. Photographs are especially wanted; all such will be carefully handled and returned to the sender. If you can help us, please write or call (collect) Miss Patricia Powell, 344 West 12 Street, New York 10014 (212-243-5318), or me at the address below (415-362-7582).

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Beam Storage in the Cambridge Electron Accelerator

High-energy beams of electrons have been stored with d-c magnetic fields in the alternating-gradient (AG) synchrotron at the Cambridge Electron Accelerator. Circulating currents of several milliamperes were obtained at energies of 500 and 750 Mev. The lifetime of the stored beam at 500 Mev was 8 seconds, 1000 times longer than the normal accelerating time. Analysis shows that the lifetime is limited by the radial blow-up due to radiation antidamping.

This result was obtained by turning off the a-c power to the ring of magnets (time constant of 0.5 second) and allowing the last injected pulse of electrons to be accelerated and decelerated (at 60 cy/sec) until the magnetic field stabilized at half the peak value. Adiabatic damping due to the rising value of the minimum field reduces amplitudes during the change in magnet excitation. The radio frequency is operated in a continuous-wave mode to maintain phase stability. In the AG magnet system of the CEA, the growth of radial betatron amplitudes due to synchrotron radiation, with a time constant of 3.5 seconds at 500 Mev, eventually destroys the stored beam. Installation of a "damping" magnet is planned to provide damping in the radial mode, and to allow storage up to 4-Gev energy. Beam lifetime should then be limited only by gas scattering and bremsstrahlung losses.

This experiment is one step in a development program to produce and store counter-rotating beams of electrons and positrons in the CEA to provide a colliding beam capability.

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The Landscape: Economic Abandonment

Abelson's editorial on conservation and natural beauty (17 Dec., p. 1539) stirs me to make a few comments. For the past decade and a half I have lived in the southern Rocky Mountain province (more particularly the "Hispanic" southwestern portion of it). This is predominantly a region of wildlands, ranging from Upper Sonoran semidesert to Alpine montanas of great scenic beauty and cultural interest. A good deal of my work has been in the sphere of regional planning and rural economic development. I would like to suggest that the overwhelming need and challenge in areas such as this is not so much for bureaucratically managed conservation programs and quarantined wilderness areas, as for the redevelopment of genuine "agrestal" economic communities, permanently based in wildlands and forest areas and making their living from the skillful management and utilization of the lands, waters, and other resources of these areas. Most of the deteriorating landscape in regions such as this is not the choice scenic and climax forest areas lying in national parks, but the vast expanses of open lands of mixed classification and mixed ownership which are dropping out of economic use and degenerating into a sort of feral zone of cut-over woodlands, abandoned fields and small farms, decaying settlements, and the like.

The underlying dynamic of this decline is, of course, the capital-conserving and capital-concentrating tendencies of our society, which are progressively raising the minimum size for productive units competitive on the national market. The logic of this process, unanswerable in terms of orthodox economic analysis, is nevertheless highly destructive of the ecology of large sectors of the North American landscape.

How to reverse this process and reintroduce skillful and effective human care and occupancy in such landscapes seems to me a problem of the utmost importance for the coming generation. Success in this effort obviously bears very strongly on the complementary problem of excessive and unbalanced urbanization which is plaguing our great cities. The present formula for custodial management of open lands by various federal agencies seems to offer little promise in this direction. It is an unfortunate fact that the policies of most such agencies, being of necessity shaped by the same labor-saving and capital-conserving logic which dominates private industry, usually hasten the very processes of economic abandonment which they are supposed to combat. (They also foster the overuse of specialized areas in the national parks and forests, resulting in the "summer slums" which the editorial commented on.) The cumulative result of such policies and trends is that increasingly large sectors of North Amer-