Two Heads Better Than One?

A characteristic feature of the perennial call to action in behavioral science is the project for producing a unified theory of man and society by bringing together experts from various special fields. If the experts are given an extended opportunity for close communication, so the proposal runs, then they will successfully pool their separate bits of knowledge. Much hope is placed these days on team efforts, and there are occasions both in science and in other enterprises when a team effort has many advantages. However, there are also occasions when knowledge is not additive, when a team is no better than its best member.

The motivation for seeking a unified theory of behavior arises in part from a comparison with physics. The study of man and his institutions has been conducted for about as long as has the study of inanimate matter, but with somewhat less success. One peculiarity of physics is the way it develops around separate centers which are then combined to form comprehensive theories. But in behavioral science, despite the development of impressive techniques for measuring intelligence, attitudes, and other quantities, and despite extensive qualitative studies, efforts to effect the same kind of unification as is found in physics have not met with the same kind of general acceptance of results.

Although a comprehensive theory of behavior may be most desirable, we question whether a team project offers any special promise of success. And, by continuing the comparison with physics, we may be able to suggest why not. Consider, first, a rather different sense in which two sciences may be pooled—namely, the use of one science as a base of operations from which to assist the advance of another. An example from current research is the use of rockets to advance the study of the upper atmosphere. Here the team approach is clearly useful, but unfortunately there is no real unification. In fact, expert A can make use of expert B's knowledge only because A does not need to know what B knows. Thus, the man who launches the rocket need not know anything about its payload, and the man who studies the upper atmosphere need not know anything about how his instruments got up there.

Now consider the problem of uniting the parts of science to form a comprehensive whole. The temptation again is to identify the men who know the parts and to unite them. But now this operation makes less sense, for to make the separate pieces of science stick together requires the cement of new scientific knowledge. Expert A can no longer make use of expert B's knowledge, because A and B both ask the same question and neither knows the answer. Thus, suppose that in the middle of the 19th century a group of experts had been formed to tackle the problem of unifying the sciences of electricity and light. If the group had included James Clerk Maxwell, then surely it would have been successful—but then how necessary would the other members of the group have been? If the group had not included Maxwell, then to produce the electromagnetic theory of light, the group would have had first to come up with the equivalent of Maxwell's revolutionary hypothesis of displacement currents.

No doubt, at every level, from the family to international relations, there is a great need for the applications of a successful behavioral science. But without being branded as hopelessly old-fashioned, may we suggest that there are other ways to spend money in this science—ways which, if less dramatic than team projects of unification, are also more likely to succeed? Two heads may be as good as one, but they are not always better. —J. T.
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to different distances from the eye of the observer, its apparent brightness thus being made to vary. No telescope was used, and the observer simply held up the device so that he could see both the star to be measured and the little lunar image. He then slid the optical unit to such a distance that the star and the lunar image appeared equally bright, after which he measured the distance from his eye to the artificial star and used the inverse square law to derive a magnitude for the actual star. This simple device was typical of the genius which Herschel had for neat improvisation, and it is regrettable that his use of it seems to have been rather limited.

The flavor of the Herschel correspondence makes it clear that he was well versed in the classics and in the antiquarian lore of the constellations. Naturally, too, from his researches both in the North and the South, Herschel was familiar with all the constellation names then current, and he formed the opinion that reform of the nomenclature and boundaries was long overdue. In his day the northern constellations were much as we know them now, and the principal southern constellations were, and are, as they were named by Lacaille. Herschel embodied his plan for constellation reform in several letters to Maclear. Briefly, he wished to have every constellation of moderate extent bounded by a convex polygon, and to have either star-free vertices or vertices marked by stars. All names were to be different—and not names of individuals but of classes of persons, such as Rex, Heros, Poeta, and so on. All stars brighter than the fourth magnitude were to have individual names, and groups of stars were to be named after "well recognised classical assemblages" such as Pleiades, Muses, Graces, or Nymphs. Another idea was that the initial letter of the name of the constellation should correspond roughly, through its alphabetical position, with the right ascension of the constellation, and (to quote) "that all attempts to accommodate the attitudes or outlines of Figures to the stars of constellations... be given up as useless & hopeless labour and that maps with figures on them be regarded as children's toys."

Maclear quite liked the proposition but felt that it would not be accepted, for Herschel displayed the eccentricity of wanting to keep Orion as a constellation but with the figure reversed. That reform was desirable can be seen from some of Herschel's lists: there were Hydra, Hydrus, and Hydra Femella (now obsolete) as well as Serpens and Draco; a Musca in both the North and South, and Apis and Apus adjacent to each other, as well as many other duplications. The issue came to a head when a French naval officer visiting the Observatory felt that he had been impolitely treated. In his diary, Maclear described the note as "... a literal copy—written on a slip of dirty paper & sealed with a bit of wax with the impression of the thumb!" The duel was not fought. [By permission of Her Majesty's Astronomer at the Cape]

Extract from Maclear's diary quoting a challenge to a duel. A French naval officer visiting the Observatory felt that he had been impolitely treated. In his diary, Maclear described the note as "... a literal copy—written on a slip of dirty paper & sealed with a bit of wax with the impression of the thumb!" The duel was not fought. [By permission of Her Majesty's Astronomer at the Cape]
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Letters

On the Pay of Biologists

The announcement "Pay Up for Some Government Scientists" in a recent issue of Science [127, 21 (3 Jan. 1958)] states that biologists are not included in the pay increase. This seems to be an old and perennial problem among the biologists. I am reminded of the following note I came across this past summer while reading through some old correspondence of the naturalists (Hyatt, Packard, Putnam, and Morse) who founded the Peabody Museum of Salem, the American Naturalist, and the American Society of Naturalists.

Rochester, New York
May 18, 1870
I am well aware that works of scientific character are not remunerative, and regret that you have not received the money [sub-
  scription money sent to the American Natu-
  ralist, not properly credited]. Scientific men get much less for their services than any other class of workers. Audubon's great work on birds was a failure in a pecuniary point of view. Le Balian, the great African traveler, died absolutely poor. I am informed our great American botanist Asa Gray gets the meager sum of fifteen hundred dollars a year for his valuable services. And many others might be mentioned of like character.

Sincerely yours,
ROBERT BUNKER

The biologist continues to be low man on the scientific totem pole.

RALPH W. DEXTER
Department of Biology, Kent State University, Kent, Ohio

Department of Science

In the editorial of the 31 January issue of Science [127, 213 (1958)], you question the effectiveness and usefulness of a Secretary of Science, and it seems to me that you prefer the idea of adding a science adviser to some Government departments. There may be a possibility of joining these two ideas: The Secretary of Science would appoint the science advisers for the different departments, so that no overlapping would occur. In this way the Secretary of Science would have a great responsibility and a very useful task.

But this is not all. There is no longer any value in having a combined Department of Health, Education, and Welfare. Each activity in itself is too great a task for the three to be handled together by one department. The best thing would be to separate the "Education" and to put it under the Secretary of Science. There are so many things to decide, to order, to explore, and to alter that this Department of Science would be fully occupied. There would be one office which could make decisions for the nation and for all levels of schools as well

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"This organism appears to be different from those reported in the literature."

"This organism proved to be a hitherto undescribed actinomycete and is named

---"

"Since the characteristics of this organism were not in accordance with those of any of the Streptomyces listed in Bergey's Manual of Determinative Bacteriology, it was given the name

---"

Sometimes no evidence is presented that a thorough search of the literature has been made, and frequently the new name is not even accompanied by a rudimentary description.

This practice of creating new species, not accompanied by valid descriptions, is to be thoroughly condemned. It violates both the botanical and bacterial codes of nomenclature. It is thoroughly unscientific.

I would like to recommend, therefore, that journals refrain from accepting papers for publication in which new species are listed without accompanying descriptions of the organisms or without references to prior publications of such descriptions.

Incidentally, while I am on the subject of scientific usage, attention should be called to the fact that many scientific journals have adopted the practice of avoiding the use of trade names for antibiotics in scientific papers but insist upon the proper use of scientific names in such papers. Thus, the name "chloramphenicol" is used in scientific litera-
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For additional general information request Bulletin 314. For specific information on your requirements, provide application details.

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Science and Religion

In his recent article, "Science and the citizen" [Science 126, 1225 (1957)], Warren Weaver makes the following statement: "I would suggest that an absolutely critical distinction between science and religion may be that science never will and never can actually reach the final goal of perfection, whereas religion can do so and has done so." No true scientist will disagree with the statement that science can never achieve perfection. The essence of science is the capacity for objective self-criticism and the realization that today's concepts must constantly be revised in the light of new knowledge.

But has religion achieved perfection? Assuming that the morals and ethics of human society are related to the practice of religion, can we claim "perfection" in this area? If so, why are we so concerned today about crime, social injustice, and world peace?

Religion, like science and all other human activities, undergoes change —it evolves. Julian Huxley, in Man in the Modern World (1948), traces the evolution of religion from primitive man's attempts to explain and abate the forces of nature, through polytheism, to monotheism. He concludes that the ultimate stage in this evolution will be a religion that is largely "a deep concern for the welfare of one's fellow man with God absent or merely in the background." Whether we like it or not, the principal religions of the world are steadily moving toward liberalism and humanism, and away from fundamentalism. For example, a survey of the religious beliefs of prominent scientists in the United States [H. J. Leuba, The Belief in God and Immortality (1916)] showed that only 21 percent believed in a personal God—that is, a God capable of interceding in the affairs of man.

How can anything that is changing and evolving be considered to be "perfected"? Is any human activity "perfect"? But suppose we concede that at some time and place in the world there was (or is) a "perfect" religion. Where does this concept lead? It means that the "perfect" object must be defended against all change, because any change is bad—it is away from perfection. We force ourselves into a position of defending the status quo at all costs. Further investigation, discussion, or criticism must be prevented because they lead not to improvement but to "heresy." This is the doctrine of infallibility based on authority. To such a model of "perfection" science is a real threat. The methods of science depend on the light of unbiased new truth, a devotion to self-criticism, and a capacity for change.

As Dr. Weaver points out, the layman is often concerned about the so-called conflict between science and religion. Einstein, in his essay on "Science and Religion" [Out of My Later Years (1941)], discusses the source of this historical conflict. It occurs chiefly in the area of interpretation of natural phenomena. According to Einstein, religion is incapable of establishing the cause-and-effect relationships of physical occurrences in nature, but its insistence on doing so has led to innumerable conflicts in the past, most notably the clashes that arose with the discoveries of Copernicus, Galileo, and Darwin. He further states that "the doctrine of a personal God interfering with natural events could never be refuted, in a real sense, by science, for this doctrine can always take refuge in those domains in which scientific knowledge has not yet been able to set foot. A doctrine which is able to maintain itself not in clear light but only in the dark, will of necessity lose its effect on mankind with incapacal harm to human progress."

How does this doctrine of "perfection" in religion affect the layman's understanding of science and religion? It requires the conviction that, in any conflict between science and religion, religion is right and science is wrong. It undermines confidence in the objective methods of science and in the validity of its accomplishments. The layman is apt to regard lack of agreement among scientists as a sign of weakness rather than as a source of strength. But, most of all, the layman is likely to mistake the enforced conformity of authoritarian religions for evidence of Truth.

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Meetings

American Astronautical Society

The American Astronautical Society, founded in 1953 and incorporated in New York State in 1954, is a scientific organization dedicated to advancement of the astronautical sciences. The society considers manned interplanetary space flight a logical progression from today's high-performance research plane, guided missile, and earth satellite operations. The scope of the society is indicated by a partial list of the astronautic fields of interest: astronavigation, biochemistry, celestial mechanics, cosmology, geophysics, and space medicine, as well as space vehicle design, including communications, control, guidance, and propulsion.

Promotion of astronautics is accomplished by the society largely through its program of technical meetings and publications. The fourth annual meeting, held in New York City 29 to 31 January, was attended by over 600 members and guests. Forty-five original papers were presented, in technical sessions on "Space vehicle design," "Space exploration," "Guidance and control," "Man's environment in space," "Space vehicle communications," and "Astronautics research." At the Honors Night dinner, presentations were made to recipients of the AAS Space Flight award, the Melbourne W. Boynton award for space medicine, and the Annual Fellow awards. Plans are currently being formulated to hold the fifth annual meeting in Washington, D.C., at the end of December, in conjunction with the annual meeting of the AAAS. In addition, a West Coast regional AAS meeting will be presented in San Francisco in August.

Regional sections of the American Astronautical Society have been formed in New York, San Francisco, and Washington, D.C. Technical meetings, dinners, and field trips are among the activities arranged by these sections. Considerable interest has been expressed by AAS members and others in the formation of new regional sections in Los Angeles, Baltimore, Dallas, Philadelphia, Dayton, Boston, and Chicago. It is expected that most of these groups will be chartered as AAS regional sections during 1958.

Publications of the society include the Journal of the Astronautical Sciences, Proceedings of the AAS annual meetings, and reprints of technical papers. At the present time the Journal is published quarterly and incorporates the "Astronautical Sciences Review." Ultimately, it is proposed to publish the "Astronautical Sciences Review" separately as a companion magazine which would contain articles of general interest, AAS news, abstracts, book reviews, and so on.

Membership in the society is com-
posed primarily of scientists and engineers, although all persons having a sincere interest in astronautics, including students, are eligible for special grades of membership. Each year the board of directors and the fellows of the society elect as fellows those who have made direct and significant contributions to the astronomical sciences. At the present time, the roster of AAS members includes about 600 persons. Additional support of the society is sought from American industry. There are presently seven AAS corporate members: Varo Manufacturing Company; Avion Division—ACF Industries, Inc.; Douglas Aircraft Company; Republic Aviation Corporation; Space Corporation; Kearfott Company, Inc.; and the Martin Company. The society cooperates fully with other national and international scientific organizations; it is a member of the International Astronautical Federation and an affiliate of the American Association for the Advancement of Science. Paul A. Campbell of the U.S. Air Force Office of Scientific Research has been appointed the 1958 representative on the AAS council.

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**Chemical Organization of Cells**

A Conference on the Chemical Organization of Cells, Normal and Abnormal, will be held in Madison, Wis., 21, 22, and 23 August. Participants will be specialists in anatomy, biochemistry, embryology, and pathology who will provide correlated recent information about the cell in a series of formal presentations. Inquiries should be addressed to: Dr. Joseph J. Lalich, Professor of Pathology, University of Wisconsin, Madison 6, Wis.

A limited number of travel stipends may become available later this spring. Information will be advertised in appropriate journals and circularized to those who have already registered with Dr. Lalich for the conference.

**Physiological Sciences**

The 21st International Congress of Physiological Sciences (physiology and pharmacology) will be held in Buenos Aires, Argentina, 9–15 August 1959. Bernardo A. Houssay will be the president. The Organizing Committee consists of E. Braun Menéndez, chairman; A. O. M. Stoppani, secretary; E. Strajman, treasurer; and M. H. Burgos, H. Chiodi, T. Combes, E. D. P. De Robertis, J. C. Fasciolo, V. G. Foglia, E. Hug, A. Lanari, L. F. Leloir, J. T. Lewis, R. E. Mancini, E. Moisset de Espanez, E. L. Rabass, L. M. Rinaldini, and others. The conference will be held in the University of Buenos Aires. The organizing committee expects to publish a complete list of participants in the Bulletin of the International Congress of Physiological Sciences.

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Junior Spectrophotometer Bulletin B-240A
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Sensory Deprivation

A Symposium on Sensory Deprivation will take place in Boston, Mass., 20–21 June, under the joint auspices of the Psychiatric Research Laboratory, Boston City Hospital, Harvard University Medical School, and the Office of Naval Research (Physiological Psychology Section). The symposium will be a closed working meeting of invited speakers and discussants. Proceedings will be published. The planning committee consists of Philip Kubzansky, P. Herbert Leiderman, Jack H. Mendelson, Donald Wexler, and Philip Solomon (chairman).

Society Elections

- Econometric Society: pres., James Tobin, Department of Economics, Yale University; v. pres., M. Marcel Boiteux, Paris, France; sec., Richard Ruggles, Department of Economics, Yale University, New Haven, Conn.; treas., Nancy Ruggles, New Haven, Conn. The representative to the AAAS Council is Charles F. Roos, New York, N.Y.

- Western Society of Naturalists: pres., and representatives to the AAAS Council, Tracy I. Storer, University of California at Davis; past-pres., and representative to the AAAS Council, William M. Hiesey, Carnegie Institution of Washington, Stanford, Calif.; v. pres., Herbert L. Mason, Department of Botany, University of California, Berkeley; treas., Robert L. Fernald, Department of Zoology, University of Washington; sec., John P. Harville, Department of Biology, San Jose State College, San Jose 14, Calif.

- Ecological Society of America: pres., Stanley A. Cain, School of Natural Resources, University of Michigan; v. pres., Thomas Park, Hull Zoological Laboratory, University of Chicago; sec., John E. Cantlon, Department of Botany and Plant Pathology, Michigan State University, East Lansing, Mich.; treas., Jack S. Dendy, Department of Zoology and Entomology, Alabama Polytechnic Institute. The representatives to the AAAS Council are Henry J. Oosting and W. Frank Blair.

- Florida Academy of Sciences: pres., Dan A. Thomas, Physics Department, Rollins College; pres.-elect, and representative to the AAAS Council, E. Ruffin Jones, Department of Biology, University of Florida; sec., Guenter Schwarz, Department of Physics, Florida State University, Tallahassee, Fla.; treas., Alex G. Smith, Department of Physics, University of Florida.

Forthcoming Events

May


25–29. Institute of Food Technologists, annual, Chicago, III. (C. S. Lawrence, IFT, 176 W. Adams St., Chicago 3.)


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SUBSTITUTION WEIGHING principle used on Right-A-Weigh balance...sample pan and weights are suspended from same end of beam. In weighing...equivalent weights are removed from above the pan. Beam load is always the same.

THE DAMPER is an air dashpot on the rear end of the beam and brings the balance to rest in shortest practical time. Damping can be adjusted.

THE OPTICAL SYSTEM gives high magnifications and sharp definition. Projected lines represent 1 mg and are 2.5 mm apart on screen. Easily read to 1/10 mg on vernier, can be estimated to 1/20th mg. Green filter reduces eye strain.

THE OPERATION MECHANISM is controlled by a lever located at the front of case.

THE CASE is aluminum finished in smooth brown hammettone. Has two sliding doors.

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Sensitivity .......... 1/10 milligram
Pans: Stainless steel recessed plates, 4½” wide at bows.

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27-31. Thermal and Hydraulic Power Stations, Liège, Belgium. (A. Biron, 1, rue de Spa, Liège.)

28-8. European Federation of Chemical Engineering, 2nd cong., Brussels, Belgium and Frankfurt/Main, Germany. (Deutsche Gesellschaft für Chemisches Apparatentechnik, Rheingau-Allee 25, Frankfurt/Main.)

29-31. American Acad. of Dental Medicine, 12th annual, Montreal, Canada. (G. W. Atkinson, AADM, 45 S. Broadway, Yonkers, N.Y.)

31-8. European Federation of Corrosion, 2nd cong., Frankfurt/Main, Germany. (Gesellschaft Deutscher Chemiker, Hauser der Chemie, Karlstrasse 21, Frankfurt/Main.)

June


2-5. American Nuclear Soc., 4th annual, Los Angeles, Calif. (ANS, P.O. Box 963, Oak Ridge, Tenn.)


2-6. Medical Library Assoc., 57th annual, Rochester, Minn. (T. E. Keys, Librarian, Mayo Clinic, Rochester.)


3-5. Special Libraries Assoc., annual, Chicago, Ill. (M. E. Lucius, SLA, 31 E. 10 St., New York 3, N.Y.)


5. Institute of Microbiology, 4th annual, New Brunswick, N.J. (E. R. Isaacas, Inst. of Microbiology, Rutgers Univ., New Brunswick.)

9-11. American Assoc. of Spectrographers, 9th annual symp., Chicago, Ill. (H. J. Hettel, Armour Research Foundation, 10 W. 35 St., Chicago 16.)

9-11. Canadian Federation of Biological Societies, 1st annual; with Canadian Assoc. of Anatomists, Canadian Biochemical Soc., Canadian Physiological Soc., and Pharmacological Soc. of Canada; Kingston, Ontario. (E. E. Benale, Montreal General Hospital, 1650 Cedar Ave., Montreal 25, F.Q.)


9-12. Microscopy Symposium, 5th, Chicago, Ill. (W. C. McCrone, Jr., 500 E. 33 St., Chicago 16.)


10-12. Astronomical Soc. of the Pacific, annual, Los Angeles, Calif. (S. Einarson, Leuschner Observatory, Univ. of California, Berkeley 4.)

10-13. Vacuum Techniques, 1st internat. congress, Namur, Belgium. (E. Thomas, c/o OSN/ERM, 30, avenue de la Renaissance, Brussels 4, Belgium.)


14-21. American Soc. of Medical Technologists, annual, Milwaukee, Wis. (Miss R. Matthaei, Suite 25, Hermann Professional Bldg., Houston 23, Tex.)


(See issue of 18 April for comprehensive list)