Health Care Crisis

The fashion this season is to talk about the health care crisis (1); four years ago, style dictated discussion of the health manpower crisis (2). The attempt to solve both of these crises has led to the definition of job roles for new types of health professionals and the development of programs to train them (3) as well as the creation of new medical schools and the expansion of enrollments at existing schools (Table 6 in (4)). Recently the development of a new program to train Ph.D.'s in the life sciences as physicians was reported in Science (5).

This response seems quite similar to the outpouring of interest, energy, and funds with which this nation met the technology gap and the scientific-engineering manpower crisis of the Sputnik era (6). Once again, hearings are held in the nation's capital, programs are proposed, legislation is enacted, projects are funded. A backward glance at the fruits of the response to the earlier crises may prove instructive.

Because science was stressed in the elementary school, improved via new curricula (BCS biology, PSSC physics, Chem-Study chemistry) in the high school, encouraged by summer stipends at the college level, and supported extensively by grants and fellowships at the graduate and post-doctoral levels, many students who might have entered other fields chose to become scientists (7). Colleges and universities, supported by grants from the federal government via the National Science Foundation and the Department of Defense, expanded their science staffs and enrollments, developed teaching and research programs in such fields as high-energy particle physics and molecular genetics, and moved laboratories from the basements of old buildings to the top floors of new science centers. Of course, building faculties and facilities took time.

Now there is an overabundance of Ph.D.'s in all fields, especially the sciences (8). While the job outlook for scientists and engineers is the worst in twenty years (9), the production of new Ph.D.'s in these very fields is just reaching its peak. It appears that there has been a tremendous waste of both money and manpower because of an overresponse to what was perceived as a crisis.

Let us turn to the health field. It currently takes 10 years for a first-year medical student to enter the health manpower pool; it takes 5 to 10 years to plan and staff a new medical school before it can accept its first class. The training of other kinds of health professionals is less extensive but may still require 3 to 4 years beyond high school or college. It may be true that more doctors are needed; it is apparent that doctors are useful to people in a very real and personal sense, unlike other highly trained professionals; it is clear that we could always export doctors to countries with health personnel shortages. The time, effort, and expense involved in training doctors and other health professionals, however, compel me, like Cassandra on the threshold, to sound a warning against proceeding too far too fast. The rapid increase in enrollments in the health professions has been documented (10); it would be almost criminal to again encourage our youth to enter a lengthy program of specialized training if, when they completed the course, they were to find that the prize they had sought had vanished.

Daniel J. Fink
Department of Preventive Medicine and Community Health, School of Medicine and Dentistry, University of Rochester, Rochester, New York 14620

References


As a member of the AAAS and a physician in active practice in a relatively rural environment, I feel that it
is time to look at the other side of the “health crisis” coin.

Those of us who are serving the public in actual practice are virtually unanimous in criticizing existing government health care programs for their failure to improve our ability to provide better medical care to the recipients.

These government programs are characterized by bureaucratic inefficiency from top to bottom. Although the amount of paper work involved has not increased, there has not been much improvement. The abundance of paper work contributes appreciably to the cost per patient of health care and is disillusioning to even the most altruistically motivated idealists, who would rather spend their efforts ministering to the needs of the sick than rendering reports to Caesar.

At the same time, inadequate funding combined with inflation are reducing the material rewards by which the providers of health care are persuaded to render services to recipients of government aid. Often this results in retroactive refusal by government agencies to pay for services that were apparently authorized.

In addition, more and more people are coming to believe that “medical care is a right.” This portion of our population makes increasingly irresponsible demands on our overtaxed system in the form of minor complaints that formerly would not have resulted in a visit to the hospital or to the doctor’s office.

Whereas all of us in practice are well aware of deficiencies in the health care that is available to a small segment of our population, certain political leaders have made extravagant claims and promises, which can only be interpreted as having been made for political gain. The inflated expectations brought about by these politicians, together with the defective administration of existing programs and inadequate funding, may actually be reducing the quality of medical care available to some people in the United States.

JOHN D. MACCARTHY
635 Cedar Street, Elko, Nevada 89801

Seeking Employment

In view of the current crisis in employment opportunities for Ph.D. scientists it is interesting to note both the number and profile of those interested

For budding astrophysicists and backyard astronomers

Atoms, Stars, and Nebulae
(revised)
Lawrence Aller

It’s up there, it’s probably in here, in this scholarly but comprehensible addition to the Harvard Books on Astronomy series. If you’re a backyard astronomer, or a beginning student of astrophysics, the completely revised edition of this highly-praised book tells the story, in simple and direct terms, of how physics and astronomy work together. Illustrated. $11.95

The Harvard Books on Astronomy.

HARVARD
Harvard University Press, Cambridge, Mass. 02138

Circle No. 77 on Readers’ Service Card

Praise the Lourdes.

Beta-Fuge™

Vernitron enters the research lab with Lourdes Beta-Fuge... the only centrifuge that combines 4 litre rotor capacity with the highest possible speed. Features include patented continuous flow system with 1.8 litre sediment capacity, “Fail-Safe” brush life control, sliding top door for easy loading and unloading, solid state speed control, and temperature control range -20°C to plus 40°C.

For size and speed, there’s no better centrifuge for your laboratory than the Lourdes Beta-Fuge. For more information, write Vernitron or contact your local dealer...today. And you, too, will praise the Lourdes.

Vernitron Medical Products, Inc.
Empire Blvd. & Terminal Lane, Carlstadt, N.J. 07072

Circle No. 78 on Readers’ Service Card

767
in teaching at liberal arts colleges. This year our department had a faculty opening for an experimental physical chemist. We placed an advertisement for 2 weeks in a professional magazine. We received a total of 281 applications. On the basis of current or most recent full-time employment, these can be categorized as follows: (i) graduate students (23 percent); (ii) first postdoctoral appointees (28 percent); (iii) second or later postdoctoral appointees (11 percent); (iv) faculty members (22 percent); (v) industrial employees (13 percent); and (vi) government employees (2 percent).

The percentages of currently unemployed, female, and noncitizen applicants were 12, 3, and 27, respectively.

Jon M. Veigel
Joint Science Department, Claremont Colleges, Claremont, California 91711

Pesticide Labeling

I am collecting case histories of poisonings by combination preparations of pesticides, particularly those composed of various mixtures of phosphate esters, carbamates, or chlorinated hydrocarbons. Those cases in which information about instructions for use printed on labels have been inadequate, confusing, contradictory, or absent are especially pertinent to this study.

While there are many reported instances of poisonings by individual compounds, case reports in which several pesticides in combination were involved are not commonly reported in the literature. Many poisonings from these combinations may go unreported owing to the difficulties in establishing which of the agents is responsible for the patient's symptoms.

I urge scientists and physicians who know of such cases to write to me.

Cecil H. Fox
Box 19367, Washington, D.C. 20036

Definition of "Good Teaching"

In his letter of 11 June, Dow pleads for a definition of "good teaching."

A good teacher is a person who provides far more than textbooks or lectures; he offers himself as a model for his students' identification; through him they not only know more than they knew before, but also they are more than they were before. A good teacher, regardless of his subject, catalyzes the student's self-discovery, and the joy of the ding an sich—the thing-in-itself, the excitement of knowing for itself. The great teacher goes farther; in his unique way, he legitimizes for his gifted students the myriad awe-inspiring experiences from which new creative possibilities and combinations spring forth.

John Ciardi correctly notes that American mass education aims for the development of a universal standard of subliteracy. As the educational edifice weakens, its standards fall farther, its incredible bureaucracy proliferates, and it is no wonder that educators must indulge in pseudoscientific, numerological mumbledeg to "discover" what it is they think they are supposed to be doing with students. As Dow states, "many of the teaching-versus-research studies ... simply result in quantifying the obvious." How right he is!

Donald B. Rinsley
3212 Eveningside Drive, Topeka, Kansas 66614

Women in Physics

The American Physical Society has appointed a Committee on Women in Physics which requests the following information for its study.

First, we are compiling a roster of women physicists and would very much like to know the names and present addresses of all women physicists, especially those who are not members of the American Physical Society. The term physicist is meant to include women with B.A.'s, B.Sc.'s, or higher degrees who are actively engaged in work related to physics and also women with advanced degrees in physics working in areas not related to physics or not presently working.

Second, we are soliciting comments and recommendations to the committee from all women physicists, both members of the American Physical Society and nonmembers.

Vera Kistiakovsky
Committee on Women in Physics, 575 Technology Square, Room 408, Massachusetts Institute of Technology, Cambridge 02139
Dispense precise volumes automatically

If you need to dispense precise volumes of liquid ... in automated, semi-automatic, or on-demand applications ... our Precision Liquid Dispenser will solve some of the problems encountered in other dispensers. It offers high precision over a range of 1 µl to 10 ml. Any of eight syringes with Teflon* tipped plungers may be used interchangeably. Cycling rates for collecting and dispensing are adjustable. With our Teflon dispensing tips your system may be completely inert. Delivery volume is adjustable continually from 2% to 100% of the syringe scale. If you need to deliver microliter volumes, precisely ... investigate our Precision Liquid Dispenser. It's described in our catalog ... let us send you a copy. Write to Hamilton Company, P.O. Box 307, Whittier, California 90608.

*DuPont registered trademark
Labeled Compounds for Cell Wall Research

Sialic Acid
N-Acetyl-neuraminic-4-C^14 Acid
NEC-615 45-55mc/mM $105/10µc $360/50µc
Other compounds of related interest:
D-Mannosamine-C^14 (U) Hydrochloride
NEC-613 175-225mc/mM $100/50µc $450/250µc
D-Glucosamine-C^14 (U) Hydrochloride
NEC-506X >200mc/mM $65/50µc $300/250µc
L-Fucose-H^2 (G)
NET-296 1-5c/mM $33/250µc $75/1mc
$225/5mc
L-Fucose-1-C^14
NEC-602 40-55mc/mM $90/50µc $400/250µc

PLACE YOUR ORDER COLLECT.

NEN
New England Nuclear
575 Albany Street, Boston, Mass. 02118
Customer Service: (617) 482-9599
Canada: NEN Canada Ltd., Dorval, Quebec
Europe: NEN Chemicals GmbH
Dreieichenhain bei Frankfurt, Germany

Circle No. 91 on Readers' Service Card

Free bulletin describing important new research equipment for

Neuropysiologists
Experimental psychologists
Eye, brain, heart researchers
Other life scientists
- Low-cost histogram analyzer for on-line data reduction and analysis.
- Experiment control (precision timing, sequencing of events).
- Stimulators (both modular and integrated).
- Amplifiers and preamplifiers (general and microelectrode).
- Discriminators, counters, timers, ratemeters, hard-copy interfaces.

Write for Bulletin LS-201. Ortec Incorporated, 133 Midland Road, Oak Ridge, Tenn. 37830.
Phone (615) 482-4411.

In Europe: Ortec GmbH, 8 München 13, Frankfurter Ring 81, W. Germany.
In the U.K.: Ortec Ltd., Dallow Road, Luton, Bedfordshire, England.

Circle No. 92 on Readers' Service Card

CYCLIC AMP
by G. ALAN ROBISON and EARL W. SUTHERLAND, both at the Department of Pharmacology, School of Medicine, Vanderbilt Univ., Nashville, Tennessee, and R. W. BUTCHER, Department of Biochemistry, Univ. of Massachusetts Medical School, Worcester, Mass.
This long awaited volume presents a comprehensive and critical review of our present knowledge of the many roles of cyclic AMP in biological processes, as well as a description of the methods used to gain this knowledge. The specific functions of AMP and implications for future research are included. The book contains over 1500 references, and 53% of them are to papers published in 1968 or later.
August 1971, about 500 pp., $17.50

ADVANCES IN CELL AND MOLECULAR BIOLOGY
Volume 1
edited by ERNEST J. DEPRAV, Stanford Univ.
School of Medicine, Stanford, California
This new serial publication provides succinct reviews of the several areas of cell and molecular biology receiving the most attention as the various volumes go to press. In addition to updating material in the text Cell and Molecular Biology, the series provides excellent summaries of new research trends for students and research workers alike. Topics covered in this first volume include: the biology and chemistry of chromosomal proteins, molecular mechanisms of chromosome breakage and rejoining, the molecular architecture of synaptonemal complexes, and chromosome alterations in human carcinogenesis.
1971, 328 pp., $15.00

ENZYME PURIFICATION AND RELATED TECHNIQUES
Volume 22 of Methods in Enzymology
Series Editors: SIDNEY P. COLOWICK and NATHAN O. CAPLAN
edited by WILLIAM B. JAKOBY, Section on Enzymes and Cellular Biochemistry, National Inst. of Arthritis and Metabolic Diseases, National Inst. of Health, Bethesda, Md.
This volume is a comprehensive sourcebook of available methods for enzyme purification. It presents fractionation techniques based on molecular size, shape, solubility, and charge, and includes a section on the assessment of purification. It also covers the processes of microbial growth for both small- and large-scale preparation, the isolation of certain organelles, and various methods of extraction. A discussion of large-scale enzyme preparation outlines many possibilities for working with more laboratory quantities of protein.
1971, 660 pp., $29.50

A STATISTICAL MANUAL FOR CHEMISTS
SECOND EDITION
by EDWARD L. BAUER, Winthrop Laboratories, Rensselaer, N.Y.
August 1971, about 190 pp., in preparation

ACADEMIC PRESS
NEW YORK AND LONDON
111 FIFTH AVENUE, NEW YORK, N.Y. 10003

Circle No. 50 on Readers' Service Card
NEW Polynucleotides and PNPass preps from P-L Biochemicals

4510 POLY A-POLY U, DOUBLE STRAND, PHYSIOLOGICAL SALT*, LYPHILIZED
Also available as Sodium Salt
10 mg. $18.00 25 mg. $35.00
100 mg. $90.00

4520 POLY-A-POLY U-POLY U, TRIPLE STRAND, PHYSIOLOGICAL SALT*, LYPHILIZED
Also available as Sodium Salt
10 mg. $20.00 25 mg. $40.00
100 mg. $100.00

4715 POLY I-POLY C, DOUBLE STRAND, STERILE REFERENCE SOLUTION, 1 mg./ml. IN PHYSIOLOGICAL SALINE
1 ml. $6.00 5 ml. $12.50

4257 POLYGUANYLIC ACID (POLY G) POTASSIUM SALT, LYPHILIZED Szo. w = 6.12
10 mg. $16.00 25 mg. $32.00
100 mg. $110.00

4550 POLYXANTHYLIC ACID (POLY X), POTASSIUM SALT, LYPHILIZED, $zo. w = 4.8
10 mg. $50.00 25 mg. $110.00
100 mg. $330.00

4160 POLYADENYLIC, URIDYLIC, GUANYLIC ACID; (POLY A,G) POTASSIUM SALT, LYPHILIZED, Szo. w = 8.2
5 mg. $50.00 10 mg. $90.00
25 mg. $200.00

4341 POLYINSOSINIC, GUANYLIC ACID; POLY(I,G), POTASSIUM SALT, LYPHILIZED, Approximately equal incorporation of I and G Szo. w = 11.0
5 mg. $50.00 10 mg. $90.00
25 mg. $200.00

4451 POLYURIDYLIC, GUANYLIC ACID; POLY(U,G), POTASSIUM SALT, LYPHILIZED, Approximately equal incorporation of U and G Szo. w = 6.0
5 mg. $50.00 10 mg. $90.00
25 mg. $200.00

0672 POLYNUCLEOTIDE PHOSPHORYLASE, (E. coli B), TYPE 1. Activity 25. Minimum activity 25 poly units per mg. protein (1 unit = 1 u mole ADP/15 min.)
10 units $50.00 50 units $200.00

0688 POLYNUCLEOTIDE PHOSPHORYLASE, (E. coli B), TYPE 2. Activity 0.5 to 3.0 poly units per mg. protein (1 unit = 1 u mole ADP/15 min.)
50 units $25.00 500 units $220.00

0431 POLYNUCLEOTIDE PHOSPHORYLASE, PRIMER DEPENDENT*, (M. lysodeikiticus). Synthesis of trinucleoside diphosphates or larger oligonucleotides of known sequence.
10 units $80.00 25 units $165.00
*Primer independent preparations also available.

0616 RIBONUCLEASE T1 (A. oryzae). Use with 0431 PNPass for trinucleoside diphosphate synthesis.
100,000 units $15.00
500,000 units $55.00

excellence in Biochemistry

P L biochemicals, inc.,
1037 W. McKinley Ave., Milwaukeee, Wisconsin 53205
Tel. 414-271-0657, Cable: PL Biochem

Circle No. 76 on Readers' Service Card

were at that time gathered in a single circumpolar sialic blob, one might visualize such a late pre-Paleozoic glacial episode as being truly "worldwide" as far as records are concerned. Since there is enough evidence to suggest both that this might be so and that it could provide a well-defined operational boundary between Paleozoic and pre-Paleozoic, the possibility deserves intensive, open-minded study. An interesting possibility to be considered here involves the idea that associated lowering of groundwater levels might be reflected by deep leaching and oxidation of much older BIF protorbes commonly observed where glacial deposits of younger pre-Paleozoic age are missing.

If Cloud's model of early biospheric-atmospheric-lithospheric evolution is valid, then the onset of red-bed sedimentation should be expected to overlap only slightly in time with the last major episode of banded iron formation, denoting another phase of crustal evolution that seems to have time significance and generally to separate older from younger Proterozoic. Stromatolite zonation, if it can be shown to have consistent interregional applications, would apply on a scale of units of hundreds of millions of years long, and primarily to the younger (middle and upper) Proterozoic. Soviet stromatolite students generally have supported this view, recently with the limited concurrence of Martin Glaessner and associates and of Cloud. But at this conference both Hans Hofmann and Paul Hoffman strongly questioned the utility of interbasinal stromatolite correlation on grounds of their experience with the Proterozoic rocks of Canada.

All this interplay made evident both a broad agreement about the main modalities of crustal evolution during pre-Paleozoic time in North America, and much disagreement about details, about the philosophy on which a stratigraphic nomenclature or symbolism should be based, and how many major divisions should be recognized and what names or symbols should be applied to them. In general this is so the world over at the present time. In broad terms, informed geologists generally recognize (i) a basal granite-greenstone-graywacke-beded chert-amphibolite facies older than about 2.4 to 2.7 aeons; (ii) an intermediate facies of mainly ensialic clastic prisms or wedges that includes the oldest clean quartzites and generally the youngest banded iron formation above the greenstone-granite facies and older than about 1.8 to 2.1 aeons; and (iii) a younger, more diversified set of rocks which characteristically include the oldest red beds, an abundance of commonly stromatolitic carbonate rocks, and, at many places tillite-containing sediments somewhat older than about 0.6 aeon. The words Archean, Eparcheon, Katarchean, lower Proterozoic, and middle and upper Proterozoic are commonly applied to these divisions or parts of them; but, even though the same broad groupings of rocks are recognized, usage of terms is not consistent from one continent and country to another, and there seems to be little prospect of agreement on a uniform global nomenclature at this time.

The consensus at the Medicine Bow conference, insofar as there was one, was that it would be premature to seek nomenclatural agreement. In retrospect it seems not terribly important that we could not agree on names or precise boundaries in view of the fact that we did see the same broad trends and were able to discuss them without much terminological difficulty. This is attributable, above all, to the magnificent labors of the last two generations of geochronologists. But that does not mean that radiometric numbers should define rather than calibrate crustal evolution. The issue will be rejoined—there is no doubt of that. And if it is successfully resolved, the groundwork laid at this conference may take some of the credit.

PRESTON CLOUD

Department of Geological Sciences,
University of California,
Santa Barbara 93106

Notes
1. The terms Archean and Proterozoic here refer to major divisions of the pre-Paleozoic, older and younger, respectively, than about 2.5 to 2.6 aeons, following current practice in Canada where the great bulk of North American pre-Paleozoic rocks remain. Of the respondents to a draft of this report objected to that usage as not properly reflecting the lack of agreement on nomenclature at the conference. Another felt "that almost everyone agreed that the Precambrian should be divided by arbitrary absolute time boundaries." I did not detect such a consensus, and it is convenient for present purposes, and consistent with much accepted practice, to utilize the terms Archean and Proterozoic in their Canadian sense. The reader should realize, however, that both that opinion and practice are unsettled and that there was no agreement among the conference in favor of this or any other terminology.

2. My research on the primitive earth, my contribution to this conference, and the expenses of attendance and participation by H. L. Allsopp, R. L. McConnell, and myself were supported by NSF grant GB-7851 and NASA Exobiology grant NGR-05-010-035.

13 January 1971

SCIENCE, VOL. 173