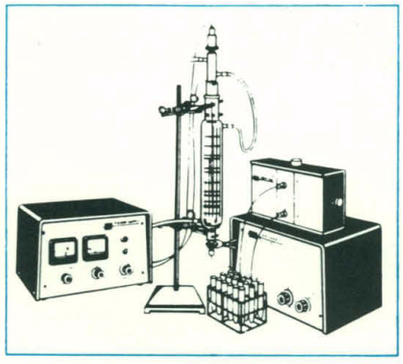
SCIENCE

23 October 1970

Vol. 170, No. 3956

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

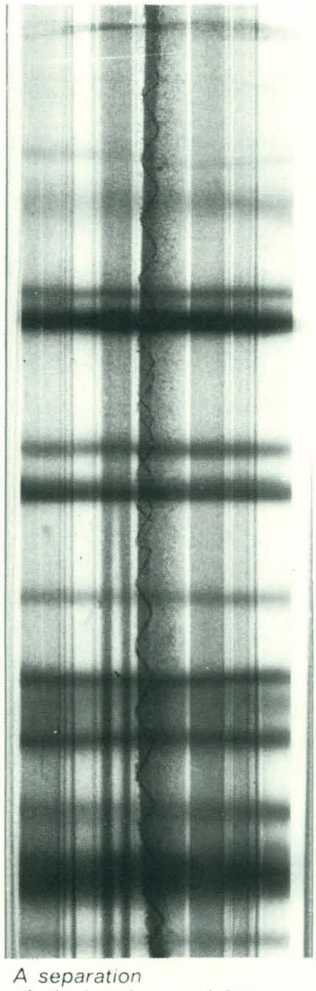
Ampholine Electrofocusing equipment,
including Power Supply,
Uvicord ultraviolet Monitor and Recorder,
ready for protein separation.



LKB IN THE SERVICE OF SCIENCE

LKB INSTRUMENTS INC. 12221 PARKLAWN DRIVE, ROCKVILLE MD. 20852
11744 WILSHIRE BLVD. LOS ANGELES CALIF. 90025

PROTEIN | Separation Purification Characterization



A separation of chicken haemoglobin.

Research establishments, hospitals, and industry throughout the world have used LKB Ampholine Electrofocusing to successfully separate the following kinds of protein.

Endotoxins from bacteria (lipopolysaccharides)
Capsular polysaccharide from H. Influenza
Urine gonadotrophins of pregnancy (human)
Pituitary hormones
Amonuim Sulfate preparations of human serum
Blood coagulation proteins, namely FXII
Whole serum
Gamma globulin
Steroid binding γ-globulin
Transcortin cortisol binding β_1 globulin
γ-globulin, transferrins
Cytochrome c from beef heart
Biliverdin-protein in eel serum
Rat fetal protein from albumin
Immunoglobulins
Bovine serum
Albumin
Ovalbumin
Intact platelet mebranes
E. coli nucleases
Enzymes catalyzing sulphydryl —disulfide interchanges
Enzymes-cellulases (some proteases)
Butyrylcholinesterases from human brain
Pancreatic enzymes
Bromelain + acid phosphatase from ananas comosus
Arylsulphatases of aspergillus oryzae
Mitochondrial transaminases
D-aspartic oxidase
Glycosidases from fungal or bacterial source
Lactoperoxidase
Invertase from yeast
Ribosomal
Catalase
Acid phosphotases
DNA polymerase
Enzymes of carbohydrate metabolism
Neurospora crassa invertase
Alkaline phosphatase in eel inthestinal mucosa
For myltetrahydrofolate syntetase from clostridium thermoaceticum
Haemoglobin
Isoenzymes of alcohol dehydrogenase
Soluble grape proteins
Influenza virus and adenovirus
Herpes simplex virus proteins
Renin (bovine, human)
Insulin
Glycopeptides of fibrinogen and platelets
Chondroitin sulfate glycoproteins
Myoglobin
Ferritin
Chemically modified myoglobin
Interferon samples from chicken eggs
High and low molecular weight glycosidases. Detergent-soluble glycosyltransferases (membrane bound)
Extracellular enzymes and toxins from staphylococcus aureus e.g. hyaluronate lyase

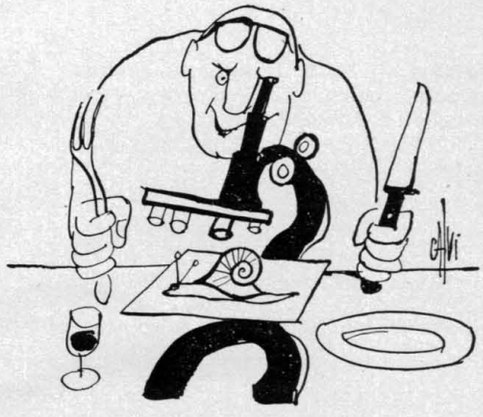
Have YOU a research problem that can be solved by LKB

Sales and service in USA: New York, Boston, Washington, Chicago, St. Louis, Atlanta, Houston, Los Angeles; in Europe: Stockholm, The Hague, Copenhagen, Rome, Vienna, London; and throughout the world.

Ampholine?

8100-A22

Tiens, une revue scientifique française.



En 6 mois, « La Recherche » est devenue la première revue scientifique de langue française en Europe.

Et nous avons tout fait pour cela.

Nous nous sommes délibérément orientés vers l'innovation scientifique et technologique.

Nous avons diversifié nos sommaires pour aborder tous les aspects de la recherche fondamentale ou appliquée.

Et nous avons choisi, pour chaque discipline, de dégager l'essentiel d'une actualité souvent surabondante : vous ne pouvez pas lire les deux millions d'articles originaux qui paraissent chaque année dans le monde.

Aujourd'hui, « La Recherche » a pris place parmi les grands de l'information scientifique internationale.

Maintenant, nous pouvons venir chez vous.

Après tout, nous parlons le même langage.

Même si nous écrivons en français.

Que trouverez-vous dans « La Recherche » ?

Un entretien avec l'actualité.

Chaque mois, les hommes engagés dans le processus d'innovation scientifique et technique exposent leurs travaux, leurs projets ou leurs idées.

Les fronts de recherche.

Des articles de synthèse vous informent sur tous les secteurs où une mutation s'amorce.

Le dossier du mois.

Sur un grand sujet, un ou plusieurs spécialistes français ou étrangers font le point des découvertes successives, de leurs conséquences théoriques, de leurs applications et de leurs retombées économiques.

Le magazine.

Des articles brefs de nos correspondants rendent compte des découvertes et hypothèses dont on commence à parler.

Les nouvelles de France et de l'Etranger.

Une revue mensuelle des travaux, des résultats dont on ne parle pas encore.

C'est tout cela « La Recherche ».

Avec,en plus,des rubriques régulières : congrès importants, bibliographies internationales, tribunes libres, etc.

Je désire profiter d'un abonnement d'un an (11 numéros) à "La Recherche", au prix spécial de lancement de $ 16.00.

M .....

Profession .....

Fonction ou spécialité .....

Rue .....

Ville ..... Pays .....

Adressez ce bon, accompagné de votre règlement, à :

Etats-Unis & Canada : Periodica, 7045 avenue du Parc, Montréal 303 - Québec, Canada.

Autres pays : "La Recherche", 4 Place de l'Odéon 75-Paris 6e, France.

Offre valable jusqu'au 1er Décembre 1970 et réservée aux lecteurs non encore abonnés à "La Recherche".

HAVAS CONSEIL

23 October 1970
Vol. 170, No. 3956

SCIENCE

SCIENCE is published weekly on Friday and on the fourth Wednesday in September by the American Association for the Advancement of Science, 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Now combined with **The Scientific Monthly®**. Second-class postage paid at Washington, D.C. Annual subscription $12; foreign postage: Americas $3; overseas $5; single copies, 50¢ (back issues, $1) except **Guide to Scientific Instruments** which is $3. School year subscription: 9 months, $9; 10 months, $10. Provide 4 weeks notice for change of address, giving new and old address and zip codes. Send a recent address label. SCIENCE is indexed in the **Reader's Guide to Periodical Literature.**

COVER

Center of Paris, showing the wide diagonal avenues that, in the 19th century, were superimposed on the existing pattern of streets, to speed transportation. Such planned cities of traditional type, the result of long human experience, tend to acquire monumental characteristics. One inch on the scale represents 0.57 kilometer. See page 393. [C. A. Doxiadis]

Democracy: Haven for Dissent

Two recent letters (4 Sept.) criticize scientists who venture to express opinions for public notice in relation to public policy matters. A third makes the same point by quoting the 267-year-old stricture by the Royal Society of London against "meddling with Divinity, Metaphysics, Moralls, Politics, Grammar, Rhetorick, or Logic." All three letters have a hollow sound in the context of present realities of the society in which we live, but the one by Arkush should not simply be ignored. He says, in relation to Nobel laureates expressing publicly their views about the impropriety of the U.S. participation in the southeast Asian war, "They apparently assume that political competence is common to all men."

Apparently Arkush chooses to ignore the fact that the assumption he decries is the central principle of democracy. Anyone who subscribes to universal suffrage implicitly makes that assumption. Democracy surely has its flaws, but nearly everyone in this country thinks it to be the best political system that has yet been devised. One of the reasons that democracy has worked as well as it has is undoubtedly because many scholars, in science as well as in other disciplines, have exercised their prerogatives as citizens to contribute to political debate. To make it work in our scientific and technological age, scientific experts must let the less well-informed public know their views. One suspects that what really bothers Arkush is that the views of the 44 Nobel laureates differ from his own, and that the general public may, as it should, be more impressed by their views expressed in concert than by his own.

MAURICE B. VISSCHER
Department of Physiology, University of Minnesota, Minneapolis 55414

To men like Russell and Arkush (Letters, 4 Sept.) who idealize "experts" and expertise and suggest that the citizens of our country remain docile and compliant to the hypnotic credo "the President knows best," I commend the following recollections by former Nazi Albert Speer in his remarkable new book *Inside the Third Reich:*

> The ordinary party member was taught that grand policy was much too complex for him to judge it. Consequently . . . one was never called upon to take personal responsibility. The whole structure of the system was aimed at preventing conflicts of conscience from even arising. . . . Worse still was the restriction of responsibility to one's own field. That was explicitly demanded . . . people were immured in closed-off, isolated areas of life. The longer Hitler's system lasted, the more people's minds moved within such isolated chambers. . . . We had derived our principles from . . . the authoritarian though not totalitarian state of Imperial Germany (*1*, p. 33). . . .
>
> With such arguments we soothed our consciences. I myself and many others snatched avidly at excuses; the things that would have offended us two years before we now accepted (*1*, p. 53).

To those who tell us we should not criticize the President I also commend a recent discerning critique of American society by T. Roszak (*2*), and especially the chapter "The myth of objective consciousness," an analysis of the "scientific world view."

SAMUEL P. HUNT
129 Whitney Avenue, New Haven, Connecticut 06511

References

1. A. Speer, *Inside the Third Reich* (Macmillan, New York, 1970).
2. T. Roszak, *The Making of a Counter Culture* (Doubleday, Garden City, N.Y., 1969).

Russell and Arkush seem to be guilty of the not uncommon fallacy of confusing the role of technical expertise in the formulation of public policy. Technical expertise establishes the boundary conditions within which decisions in regards to policy should be formulated, but does not dictate the policy decision. Indeed, if technical considerations truly dictate the decision, it is a decision of necessity and not of "policy." . . . If the President were committed to withdrawal of all U.S. forces from Vietnam as rapidly as was technically feasible, he has expert advisers who could inform him how rapidly the necessary transport facilities could be mobilized to accomplish the task. Any scientist who criticized such a timetable would be clearly obligated to demonstrate greater technical expertise than the representatives from the Pentagon. In the present situation, however, the policy decision has not been formulated on the basis of technical feasibility. The Nixon doctrine of U.S. aid to achieve self-determination and its corollary of Vietnamization is clearly not the dictate of technical expertise; it is a philosophy of world politics and the role that this nation should play. Every responsible citizen has the obligation to examine that philosophy and, if he chooses, to express his disagreement without being subjected to the erroneous criticism

that he is invading an area where he lacks the expertise for wise technical decisions.

ROBERT S. ALEXANDER
20 Forest Road, Delmar, New York

As a lifelong professor, research scientist, and active participant in local and national scientific organizations I am as much interested in the history, advancement, and utilization of science as the signers of widely publicized letters. For a long time I have resented certain prominent scientists taking on themselves the right to speak for all of science and scientists, by implication, and worse, to deal authoritatively with subjects outside their special scientific competence. In courts of law (where I have often served as an expert witness in scientific and technical problems) the court is very careful to limit any expert's testimony to areas of demonstrated competence both in general and with respect to the particular case in issue. Any court would throw out as "incompetent" the testimony of famous scientists or would-be experts in "nonscientific" areas outside their competency.

FRANKLIN S. HARRIS, JR.
15514 Tuba Street,
Mission Hills, California 91340

Oceanic Quest

Stommel, in his provocative article on future prospects for physical oceanography (26 June, p. 1531), asks "are present plans for expanded oceanographic research designed to solve basic scientific problems?" The answer is clearly no; they are designed to increase support for oceanographic work as a prerequisite to more effective use of the ocean and its resources. If successful, these plans should help scientists to solve basic scientific problems.

It is difficult to quarrel with Stommel's view that we must find out how the machinery of the ocean works before attempting to predict or control it (although many geophysical predictions contain large elements of empiricism). But having been involved in preparation of "An Oceanic Quest" and the "Ponza" Report (as was Stommel), I must disagree with his interpretation of the nature and implications of some of their recommendations.

Stommel tests these and other reports by asking whether their recommendations on basic scientific investigations in physical oceanography are adequate. Although physical oceanographers (including Stommel) participated in the studies, the principal emphasis was on cooperative and interdisciplinary programs, so it is not surprising that the purely physical aspects were not so fully developed as they might have been in more specialized groups. It should also be noted that neither study pretended to be comprehensive. On the contrary, they stressed that only *examples* of possible programs were presented.

Stommel suggests that proposals for the International Decade of Ocean Exploration (IDOE) and for the UN long-term and expanded program (LEPOR) were (or should have been) concerned exclusively with basic marine science. In fact, both programs are concerned only with certain aspects of marine science as they relate to ocean use. The reports stressed that achievement of the applied goal of enhanced ocean utilization depended on extensive scientific research and that the details of this research should be elaborated by the scientists concerned. Their intent was to establish a framework within which new support for oceanography could be applied.

Stommel is particularly hard on the Integrated Global Ocean Station System being developed by the Intergovernmental Oceanographic Commission. This program was initiated by the need to justify allocation of radio frequencies for transmission of oceanographic data and by the desire to develop an ocean counterpart to the World Weather Watch. The IGOSS was not conceived exclusively to reveal the dynamics of ocean circulation, although the dynamics of ocean circulation must be better understood before such a system can be designed. Rather it is intended to make possible eventual ocean forecasts to increase the safety and efficiency of various kinds of marine activities.

There are enough problems in the development of IGOSS without blaming it for others' sins. Nowhere in the official description of IGOSS is there reference to increasing the number of weather ship stations by 19, or beginning to set out 310 automatic data buoys in 1971. Such proposals may have been advanced in IGOSS or World Weather Watch discussions, but there is no evidence that IOC is committed to fostering them. Nor has there been any serious attempt to establish a routine global system involving hundreds of buoys, as implied by Stommel.

I can't believe that Stommel is opposed to large-scale and long-term planning. If such planning is done poorly, it is necessary both to protest and to help in doing it better. Stommel has protested and, along with many other scientists, is actively contributing to better planning. I hope that his article will not persuade these scientists that national and international efforts to enhance support for oceanography are both misguided and futile and thus cause them to withdraw their essential contribution. There is also a danger that Stommel's views will be used as a weapon against these planning efforts and the organizations engaged in them. At least internationally, these organizations are fragile, and it would be a tragedy if they were further weakened by this well-intentioned but often misleading attack.

WARREN S. WOOSTER
Scripps Institution of Oceanography, Post Office Box 109, La Jolla, California 92037

Medical Editors' Dilemma

The editor of *The New England Journal of Medicine*, writing in *Science* ("Medical literature: The campus without tumult," 28 Aug., p. 831), raises anew, and in the same disturbing fashion, an issue he examined in an editorial in his own journal in September 1969: a presumed "conflict" between the priorities of publishing scientific papers in full in scientific journals and the increasingly effective and rapid reporting of scientific news to scientists by professional journalistic methods.

The nub of Ingelfinger's complaint is that full journalistic reporting of medical news in the medical press may produce a situation in which later publication of some of this material in medical journals "merely serves archival, bibliographic, and narrow technical purposes." To avert this threat, he proposes measures which boil down to plain censorship or, on the most tolerant interpretation, a self-sacrificial restriction of news coverage by the medical press.

Medical Tribune, in an editorial commenting upon Ingelfinger's published proposals a year ago, said: "The [*New England*] *Journal's* proposed policy seems to have been conceived in a moment of irritation. Already, according to *Medical Tribune* staff members, it is resulting in some restriction of legiti-

mate news at medical meetings by creating a feeling of fear among some investigators that their full papers may not receive formal publication if they cooperate with medical news reporters. The *Journal's* proposals are unworthy of the principles of medical communication that the *Journal* itself, we are sure, espouses with us."

It seems odd—nay, anachronistic—in a time when professional and public support is desperately sought for science by investigators, teachers, editors, and students to avert budgetary disaster—to find restriction of news being advocated in the ranks of the defenders. Since Ingelfinger concedes in his *Science* article that his own journal must wait 2 to 6 months to publish what papers it does select, it should be emphasized that medical journalism has done yeoman service in shortening the time it takes to convey news highlights (virtually never the "complete conceptual and documental form" feared by Ingelfinger) from a scientific meeting, laboratory, or school to the practitioner in the field.

I am sure there will be others—professional science writers and editors in particular—who wish to examine Ingelfinger's premises and conclusions with great care. If there is a problem, it does not lie in his imagined competition but rather in the need for regular and comprehensive study of the critical requirements of communicating scientific information to the professions and the public.

FREDERICK SILBER

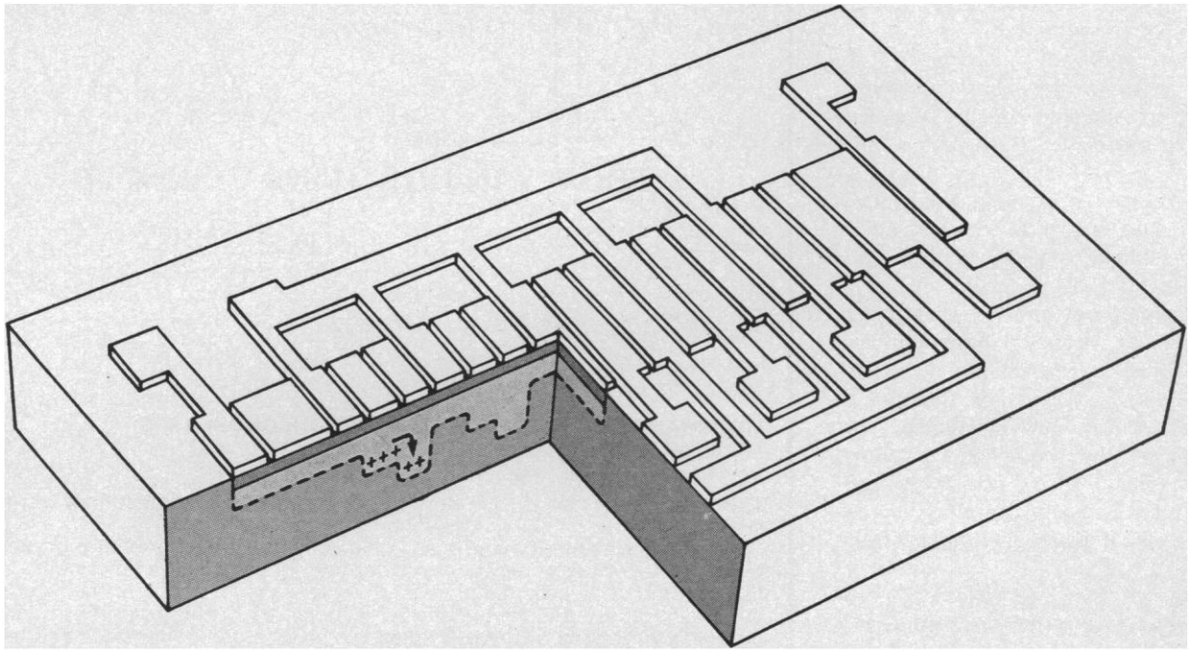
Medical Tribune,
110 East 59 Street, New York 10022

No Wrangle

May I set the record straight with reference to an allegation [attributed to E. G. Sherburne, Jr., director of Science Service] in Boffey's article (18 Sept., p. 1182)? Marcia Nelson was not "fired . . . at least partly because her job had largely been taken over by a computerized subscription service." I was, in fact, not fired at all, but resigned, partly for the reason stated, and partly because of a completely amicable agreement between Sherburne and me to disagree about some aspects of my job. No wrangle was involved in this action.

MARCIA NELSON

1305 Providence Terrace,
McLean, Virginia



Functional device without junctions

A junctionless semiconductor device that performs complete circuit functions has been invented by Bell Labs scientists Willard Boyle and George Smith. It may replace complex integrated circuits for information storage and other processing.

The new device consists of a layer of semiconductor (silicon) covered by a layer of insulation (silicon dioxide), with a row of closely spaced metal plates on top of the insulation. It operates much like an array of capacitors passing a stored charge—representing a binary information bit—from one capacitor to the next.

If all plates are held at a small negative voltage, the charge (holes) will remain stationary . . . stored in so-called "potential wells" below the plates. If, now, a stronger negative pulse is applied to a plate adjacent to one under which charge is stored, the charge will "spill over" into the deeper potential well thus produced (figure). So, charges can be shifted, plate by plate, along the surface of the semiconductor.

One use is as a shift register. Holes may be created at one end, moved along the semiconductor surface, and detected (read out) at the other end. Charge can be detected through the capacitance change it causes when present under a plate. The basic shift register may be used as part of a recirculating memory or as a delay line.

The new device can also convert images to electrical signals. By projection through a narrow slit, one horizontal strip of the image is focused on the semiconductor. Beneath each plate, this produces charge proportional to brightness. The shifted-out charge stream is an analog of that strip. Successive strips compose a complete image.

The first device was made of silicon. But since junctions are not needed, devices can be made from many semiconductors.

The device is so new that we haven't explored all possible applications. But its simplicity promises high reliability. And the comparatively few steps required to make it will keep costs low. We expect it to have considerable impact on telephony and on other high-volume information systems.

From the Research and Development Unit of the Bell System:

Bell Labs

23 October 1970, Volume 170, Number 3956

SCIENCE

Fact-Crazy, Theory-Shy?

President Nixon has appointed a commission* to conduct the "first comprehensive review" of federal statistics in more than two decades. Its mandate also includes the study of the needs for information about the functioning of the American economy and society. We hope that in the course of their study, the Commission will examine the balance between *collection* of information and its *analysis*. Societies differ significantly in the ways they collect, process, and use information. Some societies, for instance those of France and Germany before World War II (before their "Americanization"), were highly analytic, often short on facts but long on theorizing. On the other hand, the American system seems heavily skewed in the opposite direction; it ofen seems hip on fact but adverse to prolonged analysis.

This empiricistic tendency is reported from a large variety of American information systems. The House Defense Appropriation Committee found, in 1968, that "unprocessed reports on Southeast Asia alone recently filled 517 linear feet of file drawer space at the headquarters of the Defense Intelligence Agency." Dr. Conrad Taeuber, associate director of the U.S. Bureau of the Census, pointed out that, because of shortage of funds for analysis, "many of the significant analytic cross tabulations of the census data are left for an if-and-when basis and frequently cannot be carried out." Various data banks have been set up to bring together raw data to ease the analysis. Many of these banks, whose annual budget runs in six-digit figures or higher, are infrequently used, often yielding a lower volume of research than their custodial budget.

The reasons leading to this analysis gap are numerous. They vary from relatively manageable ones, such as granting and research-budgeting procedures, to difficult-to-alter Anglo-Saxon cultural traits. Many federal agencies and foundations frown on researchers who "budget" for analysis more than the last year of a project. ("Professors should 'think' on their own time.") Both as a frequent recipient of research grants (from agencies as different as OEO, DOD, NSF, and OE) and, recently, as a member of two grant-review boards of government agencies, I found that funds for the collection of data are much more readily available than funds for their analysis. As studies frequently run behind schedule, the analysis phase is often short—and shortchanged. In most courses on "methodology" in social science most of the time is spent on teaching the collection of data and preliminary tabulations. The more difficult-to-communicate art of analysis and interpretation is squeezed into the closing weeks of the semester.

Prestige is a factor. Dr. Harold Orlans, of the Brookings Institution, has written: "More encouragement and support can be given to the critical review and synthesis of bodies of knowledge, a function that, when it is done well, *should be* esteemed as highly as the generation of new knowledge." But it is not.

The deeper reasons for the analysis gap stem from the American tendency to be more trusting of "hard" facts than of theorizing that still carries overtones of scholasticism and dogma. Pragmatism finds data more appealing than speculation about its meaning.

The net result is a national information system which knows much more about the trees than the forest; a national perspective which is often well-informed about the specifics but lacks a comprehensive, systematic overview. Sufficient impressionistic data exists about this imbalance of our information system that the new Commission might do well to devote some of its time to ascertain its dimensions; if these should prove to be considerable, the Commission might explore ways of correcting the imbalance.—AMITAI ETZIONI, *Chairman, Department of Sociology, Columbia University*, and *Director, Center for Policy Research*

* President's Commission on Federal Statistics, a 14-man panel whose chairman is W. Allen Wallis, president of the University of Rochester, Rochester, New York.

FABRI-TEK®

announces
a new way to link your NMR spectrometer to exceptional data

For acquisition and analysis of spectral data using either Fourier or CW NMR techniques

A major design innovation in the 1080 System is its use of a single main frame to perform both stored program **and** wired program computations. Wired programming and conventional instrument controls regulate many data acquisition parameters where high speed, on-line processing is required. Stored program operations are used where complex arithmetic computations are required. If you're so inclined, the 1080 is completely programmable (like any GP computer) with a powerful repertoire of instructions and its own program assembly language.

Additional features include 20-bit word length; input signal filtering; field-expandable memory capacities from 8,192 to 45,056 words (even larger in the future); and versatility through the use of plug-in digitizers and sweep modules to meet future measurement requirements.

The 1080 System has all the required hardware and software to:

- acquire data through analog-to-digital conversion;
- improve signal-to-noise ratio by on-line signal (ensemble) averaging;
- provide off-line baseline correction and/or exponential filtering;
- transform free induction decay data to frequency spectra using fast Fourier algorithm;
- manipulate real (absorption) and imaginary (dispersion) portions of the transformed spectra to yield phase- and amplitude-corrected absorption spectra;
- integrate or perform background subtraction on the absorption spectra;
- provide oscilloscope display of input data or processed memory contents;
- read out data to an X-Y plotter, ASR-33 Teletype, or a computer-compatible magnetic tape unit.

Complete 1080 Systems capable of an 8,192-word Fourier transform start at just over $30,000. For full details write or call collect to discuss your specific NMR data problems.

FABRI-TEK® INSTRUMENTS, INC.

5225 VERONA ROAD • MADISON, WIS. 53711 • PHONE: 608/271-3333