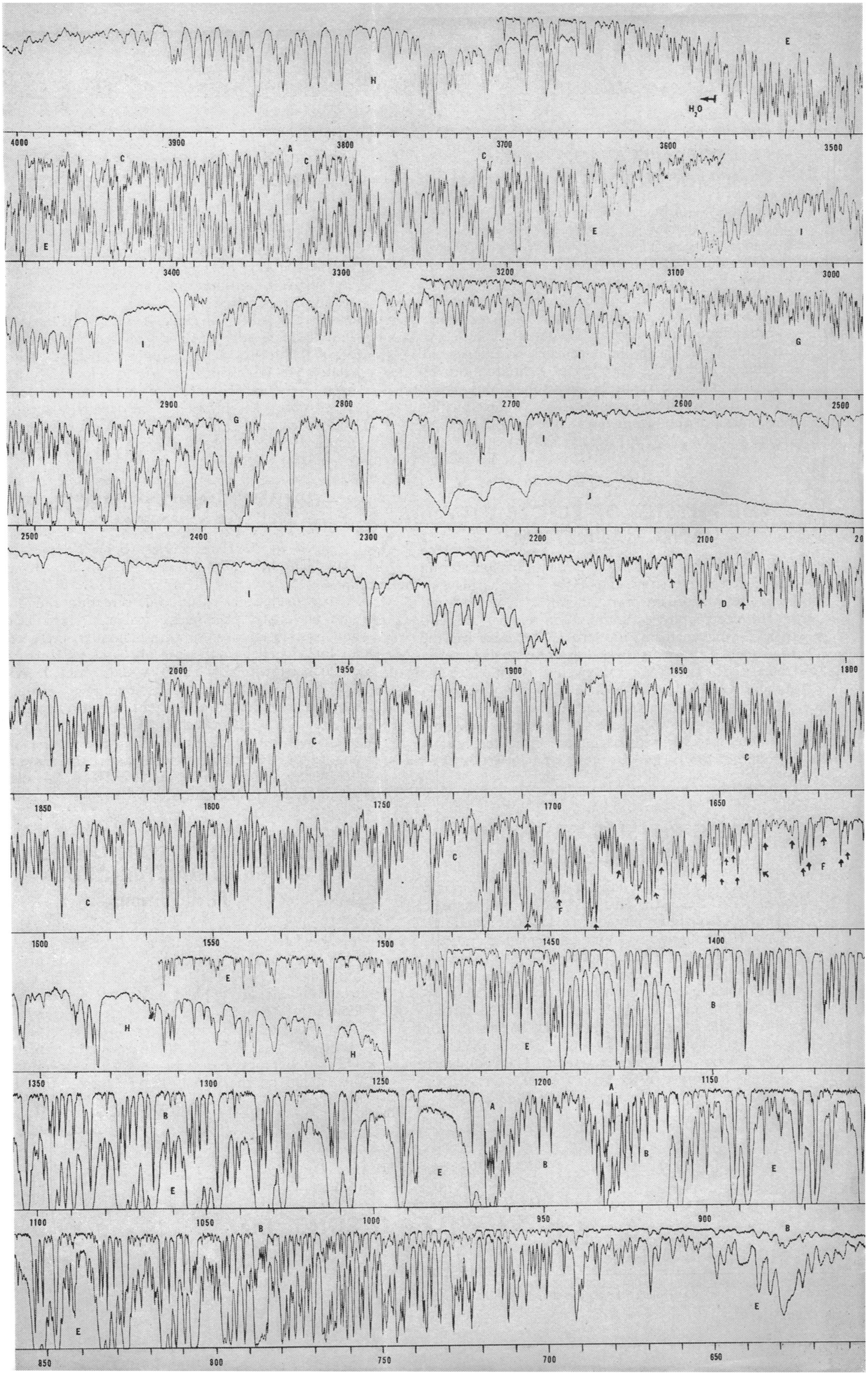
SCIENCE

13 February 1959
Volume 129, Number 3346

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

SCIENCE is published weekly by the AAAS, 1515 Massachusetts Ave., NW, Washington 5, D.C. Entered at the Lancaster, Pa., Post Office as second class matter under the act of 3 March 1879. Annual subscriptions: $8.50; foreign postage, $1.50; Canadian postage, 75¢.



H
H_2O
E
4000 3900 3800 3700 3600 3500
C A C C E E I
3400 3300 3200 3100 3000
I I G
2900 2800 2700 2600 2500
G I I J
2500 2400 2300 2200 2100
I D
2000 1950 1900 1850 1800
F C C
1850 1800 1750 1700 1650
C C C F F
1600 1550 1500 1450 1400
E H H E B
1350 1300 1250 1200 1150
B E A A E B B E
1100 1050 1000 950 900
B E
850 800 750 700 650

Letters

Adenine and Plant Growth

The provocative article entitled "Chemical basis for adaptation in plants," by E. B. Kurtz, Jr., which appeared in the 7 November issue of *Science* [**128**, 1115 (1958)] carries a brief description of some work which I did some years ago at the California Institute of Technology. I believe that Kurtz has unintentionally attributed much greater significance to this work than I myself would, and I am eager to have the situation set straight before other individuals draw unduly optimistic conclusions from the brief description in the article.

Some years ago the late Margery Hand and I found that subapical sections of etiolated pea epicotyls grew increasingly well up to temperatures of about 30°C but suffered a sharp thermal inactivation of their growth mechanism at about 35°C. Knowing that certain strains of *Neurospora* were temperature-sensitive adenineless mutants, we decided to apply adenine to these sections in an attempt to reverse the thermal inactivation of growth. This was partially successful, and, in fact, in certain experiments the presence in the culture medium of as little as 5 μg of adenine per milliliter was the difference between life and death for these little etiolated pea sections in an overnight growth test.

In subsequent experiments, described in chapter 25 of *The Experimental Control of Plant Growth* by F. W. Went (Chronica Botanica, Waltham, Mass., 1957), we attempted to extend these findings to green growing pea plants in the phytotron at Pasadena. We did find that at the higher temperatures adenine consistently increased the area and fresh weight of the leaves but had no effect on survival, or on the stem length or total dry-weight deposition. Adenine did *not* cure the entire plant of the symptoms of high-temperature injury.

There does, of course, exist a distinct possibility, fortified by the data of Highkin, as cited by Kurtz, that in more properly conducted experiments the adenine effects would show up more dramatically. For instance, we gave the high-temperature treatment only during the dark period, on the supposition that pea growth followed the general pattern of nocturnal growth, as outlined by Went for the tomato. However, it is now clear that the thermal effects on growth of peas could be expected to be great during the light period. We were also unable, in our experiments, to grow the plants at a high enough temperature, since the phytotron at that time had no chambers at temperatures over 30°C.

Certainly the chemical cure of climatic lesions is an attractive concept as well as a catchy phrase, and research in this area is very promising. One should also remember that adenine is only one of many substances which may prove to be of some aid in combating the thermal inactivation of growth. There are many temperature-sensitive genes in *Neurospora,* and indeed many probably exist in higher plants as well. One could reasonably expect that in particular plants specific amino acids, purines, pyrimidines, vitamins, and still other compounds would be effective in extending the temperature and perhaps geographic range of the plants.

ARTHUR W. GALSTON
Department of Botany,
Josiah Willard Gibbs Laboratory,
Yale University,
New Haven, Connecticut

Teaching and Research

In their book *The Academic Market Place* (Basic Books, New York), two sociologists, Theodore Caplow and Reece McGee, report the results of a survey of 371 college professors and administrators. Only 4 percent believe that the test of a college teacher's ability lies in the way he teaches; about 33 percent consider the worth of a professor by the number of papers he publishes, and the remaining 63 percent give confusing answers. This survey evidently reflects a general opinion among many professors and administrators, especially in graduate schools, where the publication of papers is often considered of more importance than the clarification of ideas, which is the quintessence of teaching.

Many papers are of great value in scholarly investigations, but unfortunately some are only of use to obtain promotions for their authors. One cynic has observed that papers of this type are abstracted, quoted, and cited in a stream of other papers which in turn are abstracted, quoted, and cited. A faculty member whose chief interest is teaching often remains unknown and unsung except among a relatively limited group of students. During his academic life-time of perhaps 40 years he may reach 10,000 young people. But in a journal of international circulation a larger audience than this is obtained with the publication of only one significant paper—an audience composed of many readers of understanding and influence in the author's chosen field. This presents a temptation and one explanation of the widespread desire to become an author rather than a teacher.

To be sure, some are so gifted and energetic that they are able to publish brilliant papers, deliver inspiring lec-

(*Continued on page 403*)

Meetings

Collegiate Academy of Science

Developments during the past few years have aroused an interest in science and scientists which has become national in scope. Many people believe that our country fails to secure the full benefit of many of its gifted young people because these superior students do not obtain the education requisite to reach the level for which they are qualified.

Only about six out of ten of the top five percent of high school graduates ever earn college degrees. Why is this true? The decision to continue in college depends upon several factors, one of which is motivation. Talented students do not want to do just what everyone else is doing—they want an opportunity to do something creative. Are our college science students being properly motivated? Are there opportunities for a talented college student who is a potential scientist to act like one? One organization formed to stimulate superior undergraduate students to do independent scientific research is the Collegiate Academy of Science. The collegiate academy not only offers a stimulus to increase interest in science, but also provides for the undergraduate a medium through which he can publish his results. Through its annual meeting, the organization also offers students an opportunity to prepare and read scientific papers.

The members of the Academy Conference Committee on Collegiate Academies of Science believe that such an organization is a distinct need. Students sometimes come from high schools that have active junior academies or science clubs to colleges that have no agency for encouraging and promoting their interest in science. The Collegiate Academy of Science stimulates continued interest in science and prevents much scientific talent from being lost. Therefore, the committee is of the opinion that the absence of collegiate academies in most of the state academies of science is a serious matter. It is hoped that the following information on the purposes, organization, and procedures of a collegiate academy will stimulate interest in this important group.

The purpose of a collegiate academy is to stimulate scholarship and research among the undergraduate students in the colleges and universities of the state who are interested in the sciences; to cooperate with the state academy of science and to aid in accomplishing the objectives of that organization; and to encourage and facilitate the exchange of information and ideas among students interested in the sciences.

Active members are usually members of clubs affiliated with the collegiate academy. However, undergraduate students in colleges and universities of a state where there is no affiliated club may also become members. Any undergraduate science club or society of a college or university of a state may affiliate with the collegiate academy by sending an application to the executive committee (or to some designated person). Annual dues for individual members should be about $1.00. These may be the only dues collected or there may also be dues for each affiliated club. In the past, some collegiate academy groups were supported by the state academy of science, but experience has proved that self-support, made possible by annual dues, is preferable.

The officers should include a president, a vice president, and a secretary. A treasurer and an editor could also be included. In some instances, a faculty member serves as treasurer. If there is a large number of affiliated clubs, it might be useful to divide the state into regions (as northeast, northwest, southeast, southwest) with a director for each region. The officers should be elected at the annual meeting from students who will be in college for one more year and should hold office for one year. The faculty sponsor (or counselor) may be appointed by the state academy of science, or he may be elected by the collegiate academy and be approved by the state academy. A collegiate academy committee composed of faculty members from several colleges may be appointed by the executive committee of the state academy of science to assist and advise the counselor. The executive committee should consist of the officers, the regional directors (if any), the faculty sponsor, and the collegiate committee (if any). The immediate past president might also be a member of the committee.

The annual meeting, which is the principal activity of the collegiate academy, should be held in conjunction with that of the state academy of science. Members should be encouraged to attend the general meetings of the senior academy. Regional meetings or other special meetings might be held at times and places determined by the executive committee. At the annual meeting, the most important part of the program is the presentation of scientific papers by student members. Interest may be stimulated by offering a small prize for the best paper. This may simply consist in having the prize-winning paper published in the senior academy journal. In some cases, certificates of merit are awarded to authors of outstanding papers, while in other instances cash prizes are given. In any case, the greatest benefit to the student comes from the experience of preparing and delivering a scientific paper.

Other suggested activities for the an-

Kodak reports on:

the stylish advent of a new polyester structure . . . the Harrow touch in autoradiography . . . who can tell you how to speed up time

KODEL is the registered trademark for a new Eastman polyester fiber. Much is to be heard of it. It significantly extends the range of fabrics and apparel that can be classed as wash-and-wear or easy care. Garments in which it is properly blended with other fibers stay fresh and neat under trying conditions. They have a pleasing, comfortable feel. Here are some 55% *Kodel*-45% worsted blends in which it can be enjoyed this coming spring and summer.

Timely's "Planet" suit, a welcome addition to the wardrobe of commuter or global traveler. The modified lounge coat with slim lapels is available in both three-button and two-button models. Your choice of seasonable colors. About $60.

Michaels-Stern has tailored this suit for the busy executive in both a bengaline plain pattern and a corded stripe, in a full range of sizes and colors. The name is "Whisper-wate" and with good reason—for the ultimate in cool comfort.

The long, slim, straight look of Varsity Town's "Picture Suit" takes on added distinction from the fabric—with Kodel's soon-to-be-famous ability for holding a press, fending off wrinkles. Note the longer lapels, higher pockets.

To the suavity customary in those who model men's wear, our three gentlemen above add authenticity. Alan Bell (left, Ph.D., McGill University, 1937) and Charles Kibler (center, Ph.D., University of Virginia, 1939) directed the first synthesis of the *Kodel* polymer in the laboratories of Tennessee Eastman Company—a true linear polyester containing a chemical group not previously present in polyesters. Emmett V. Martin (right, Ph.D., University of California, 1932), now a physicist, once wrote a paper (*Plant Physiol.*, *10*, 613-636) entitled "Effect of Artificial Wind on Growth and Transpiration in Helianthus Annuus." (That's the common sunflower.) He led the way to the unique physical structure of the *Kodel* fiber.

Imported plate

Autoradiography—the locating of radioactive tracer substance through densities or tracks generated in adjacent photographic emulsion—bloomed into full flower among histologists and other life-scientists during the period 1946 to 1951. Today the talk has drifted from technique to its findings. Unable to contribute much to that conversation, we content ourselves preparing for the autoradiographers extremely high concentrations of silver halide in gelatin. These emulsions we coat in thin layers on 5μ to 10μ plain gelatin layers for mechanical support and deliver the combination on a separable sheet of cellulose ester or a glass plate.

The user removes the double layer from its film or glass base, floats it on water emulsion side down, and then lifts it up on the slide bearing his suitably stained radioactive specimen section. In a stream of cool air, he dries his preparation down and sets it aside in a light-tight box for as many hours or days as the radionuclide requires to register its image. Then he gives the whole slide its photographic processing. The overlying gelatin layer is, of course, easily permeated by the processing solutions. Finally his microscope shows him where in his specimen the radioactivity lodged.

It so happens that in Rochester we prefer to make the base of cellulose ester, while our British cousins of Kodak Limited in Harrow put the emulsion and gelatin on glass. Moreover the Rochester and Harrow emulsions differ, the autoradiographers tell us. Knowing that emulsion making encompasses almost as many subtle variables as sonata playing, we won't argue with them. Instead we are now importing the *Kodak Fine-Grain Autoradiographic Stripping Plates AR. 10* for those who prefer them to a 35mm x 5-ft roll of *Kodak Autoradiographic Permeable Base Stripping Film.* Both have a 5μ emulsion. "Under favourable conditions," says Harrow of the plates, "a resolution of two microns may be obtained."

Eastman Kodak Company, Special Sensitized Products Division, Rochester 4, N. Y., will be delighted to have as many dozen of these 4¾" x 6½" plates shipped to a local Kodak dealer as you can pay him for at $12.40 (list) per dozen. As for the domestic film at $15 (list) per roll, ditto, of course.

Months to seconds

A *Cine-Kodak Special Camera* made most of the movies you have ever seen of a bean developing into a bean plant or a cow pasture developing into a steel plant. The *Cine-Kodak K-100 Camera*, which lists from $299, can likewise be adapted for this technique. No great resources in mechanical skills or facilities are demanded.

Mr. Fred O'Brien, Eastman Kodak Company, 400 Plymouth Avenue North, Rochester 4, N. Y., can tell you how to go about it.

Prices shown are subject to change without notice.

Kodak
TRADEMARK

nual meeting are as follows: (i) a discussion of opportunities in the different fields of science, followed by a question period (one or more members of the senior academy may indicate the types of positions available, salaries, opportunities for graduate study, and other related points); (ii) scientific exhibits (both commercial exhibits and exhibits prepared by students); (iii) scientific films; (iv) field trips to local places of scientific interest; (v) a collegiate academy banquet at which the president gives an address; (vi) a social hour or cafeteria lunch together to give students from the various colleges an opportunity to become acquainted; and (vii) a business meeting for committee reports, election of officers, and so forth.

A collegiate academy publication is, next to the annual meeting, the best means for maintaining interest. This journal should be devoted largely to the publication of papers written by the collegiates. The publication may also include a column by the president, the faculty counselor, or both, in which they discuss items of interest to all of the collegiates. News from the various chapters may also be included.

The following are additional activities which have proved successful in some of the collegiate academies now in existence: (i) local meetings; (ii) regional meetings, similar to the annual meeting but on a smaller scale; (iii) meetings of the executive committee (including one such meeting held several weeks in advance of the annual convention and another at the time of the annual convention); (iv) circular letters sent occasionally to each chapter by the president or the faculty sponsor to help maintain interest; (v) requests by the faculty sponsor for senior academy members to serve as speakers for local chapter meetings during the year (several chapters in the same city or within a few miles of one another may hold occasional joint "academy night" programs at which a senior-academy member gives a talk); and (vi) field trips sponsored by the collegiate academy.

It is the hope of the committee members that this statement of ideas concerning the purpose of and suggested activities for a collegiate academy will prove helpful to many who may wish to develop such an organization.

SISTER JOSEPH MARIE ARMER
Incarnate Word College,
San Antonio, Texas

AMY LEVESCONTE
Mary Hardin-Baylor College,
Belton, Texas

T. W. JOHNSON, JR.
Duke University,
Durham, North Carolina

Forthcoming Events

March

11–14. American Cong. on Surveying and Mapping, Washington, D.C. (J. H. Wickham, Jr., 1959 ASP–ACSM Consecutive Meetings, 610 Montgomery St., Alexandria, Va.)

13–14. American Otological Soc., Hot Springs, Va. (L. R. Boies, University Hospital, Minneapolis 14, Minn.)

13–15. Alabama Acad. of Sciences, Auburn. (H. M. Kaylor, Dept. of Physics, Birmingham-Southern College, Birmingham, Ala.)

14–15. Southwestern Soc. of Nuclear Medicine, 4th annual, New Orleans, La. (S. B. Nadler, SSNM, 1520 Louisiana Ave., New Orleans 15, La.)

15–20. American College of Allergists, San Francisco, Calif. (M. C. Harris, 450 Sutter St., San Francisco.)

16–19. American Assoc. of Petroleum Geologists, Soc. of Economic Paleontologists and Mineralogists, 44th annual, Dallas, Tex. (W. A. Waldschmidt, AAPG, 311 Leggett Building, Midland, Tex.)

16–20. American Inst. of Chemical Engineers, Atlantic City, N.J. (F. J. Van Antwerpen, American Inst. of Chemical Engineers, 25 W. 45 St., New York 36.)

16–20. National Assoc. of Corrosion Engineers, 15th annual conf., Chicago, Ill. (NACE, Southern Standard Bldg., Houston, Tex.)

16–20. Western Metal Exposition and Cong., 11th, Los Angeles, Calif. (R. T. Bayless, 7301 Euclid Ave., Cleveland 3, Ohio)

17–19. National Health Council, Chicago, Ill. (P. E. Ryan, 1790 Broadway, New York, 19.)

17–20. Organization of Research, 4th intern, symp., Milan, Italy. (I. Svergie, Produktivitetsnamnden, Linnegatan 87, Stockholm Ö, Sweden.)

18–25. International Social Science Council, 4th general assembly (by invitation), Paris, France. (C. Levi-Strauss, Secretary-General, International Social Science Council, 19, avenue Kleber, Paris.)

19–21. Society for Research in Child Development, NIH, Bethesda, Md. (Miss N. Bayley, Laboratory of Psychology, National Inst. of Mental Health, Bethesda 14, Md.)

19–22. International Assoc. for Dental Research, 37th general, San Francisco, Calif. (D. Y. Burrill, Northwestern Univ., 311 E. Chicago Ave., Chicago 11, Ill.)

20. New Jersey Acad. of Science, annual, New Brunswick. (H. L. Silverman, 361 Highland Ave., Newark 4, N.J.)

23–24. Theory of Fluid Flow through Porous Media, 2nd conf., Norman, Okla. (C. G. Dodd, School of Petroleum Engineering, Univ. of Oklahoma, Norman.)

23–26. Institute of Radio Engineers, natl. conv., New York, N.Y. (G. L. Haller, IRE, 1 E. 79 St., New York 21.)

24–27. American Meteorological Soc., general, Chicago, Ill. (K. C. Spengler, AMS, 3 Joy Street, Boston, Mass.)

27–28. Michigan Acad. of Sciences, East Lansing. (D. A. Rings, Univ. of Michigan, Dept. of Engineering, Ann Arbor.)

27–28. Pennsylvania Acad. of Sciences, Gettysburg. (K. Dearolf, Public Museum and Art Gallery, Reading, Pa.)

28. South Carolina Acad. of Sciences, Columbia. (H. W. Freeman, Dept. of Biology, Winthrop College, Rock Hill, S.C.)

29–3. Latin American Congress of Chemistry, 7th, Mexico D.F., Mexico. (R I. Frisbie, Calle Ciprès No. 176, Zone 4 Mexico, D.F.)

30–31. Third Teratology Conf., Portland, Ore. (D. L. Gunberg, Dept. of Anatomy, Univ. of Oregon Medical School, Portland.)

30–1. American Orthopsychiatric Assoc., San Francisco, Calif. (M. F. Langer, 1790 Broadway, New York 19.)

30–12. Bahamas Medical Conf., 7th, Nassau. (B. L. Frank, 1290 Pine Ave., W Montreal, Canada.)

31–2. American Power Conf., 21st annual, Chicago, Ill. (N. S. Hibshman, AIEE, 33 W. 39 St., New York 18.)

31–2. Symposium on Millimeter Waves 9th, New York, N.Y. (H. J. Carlin, Microwave Research Inst., 55 Johnson St., Brooklyn 1, N.Y.)

31–5. International Committee of Military Medicine and Pharmacy, 21st session, Paris, France. (Comité International de Médecine et de Pharmacie Militaires, Hôpital Militaire, 79, rue Saint Laurent, Liège, Belgium.)

(*See issue of 16 January for comprehensive list*)

Equipment

The information reported here is obtained from manufacturers and from other sources considered to be reliable, and it reflects the claims of the manufacturer or other source. Neither Science *nor the writer assumes* ***responsibility for the accuracy*** *of the information. A coupon for use in making inquiries concerning the items listed appears on page 406.*

■ SURFACE-MOISTURE AND SURFACE-DENSITY GAGES use a probe containing a fast-neutron source for moisture testing and a probe containing a gamma-ray source for density measurement. To perform tests, the probes are placed in contact with the surface, and the scatter of the radiation by the material is measured. Calibration curves relate scatter to moisture or density. Probes are used interchangeably with a portable scaler. The measurements sample a hemispherical volume of material of depth varying from approximately 3 to 8 in. (Nuclear-Chicago Corp., Dept. 624)

■ CONTINUOUS-TAPE CARTRIDGE is designed to accept up to 100 ft of paper or plastic punched tape for computer and similar applications. The cartridge does not require a driving belt or other external mechanism other than the tape punch or reader itself. (Brooks Research, Inc., Dept. 627)

■ MCLEOD VACUUM GAGE reads with high sensitivity to 10^{-6} mm-Hg and moderate sensitivity in the 10^{-7} mm-Hg decade. The entire range of the instrument is covered in one quadratic scale from 2×10^{-3} to 1×10^{-7} mm-Hg. Error is within ± 2.5 percent at the high-pressure end of the range. For safety, the mercury reservoir is set into a plaster of Paris base which in turn is encased in a metal container. (Consolidated Electrodynamics Corp., Dept. 629)

■ FREQUENCY DETECTOR produces an output of 0 to 500 μa d-c in response to input frequencies of 0 to 500 cy/sec. Accuracy is better than ± 1 percent. Only static magnetic components are used, and the signal being measured is the sole source of power for the instrument. Plug-in design and hermetic sealing are used. Shock resistance is 100 *g*. (Acromag Incorporated, Dept. 631)

■ PLANIMETER is designed especially for integrating records produced on 4-in.-wide strip charts of the manufacturer's recorders. Either linear or square-root totalization is available by interchange of cams. The chart feeds at the rate of 0 to 12 chart-hr/min, set by a rheostat. A pointer is positioned over the record line by means of a manually operated knob. Totals accumulate on a five-digit manual-reset counter. Accuracy is ± 1 percent of full-scale count in a 24-hr period. (Fischer and Porter Co., Dept. 634)

■ INFRARED SPECTROPHOTOMETER combines a replica grating and a single prism in a double-beam double-monochromator optical system. The instrument records automatically on a horizontal strip chart with variable abscissa and ordinate expansion. Scanning speed is variable; provision is made for repetitive scanning. Switching from double-beam to single-beam operation is conveniently accomplished. An automatic wave-member drive scans continuously from 650 to 4000 cm^{-1} and preserves linear wave-member presentation. Resolution is 0.3 cm^{-1} over the entire range. Wave-member accuracy is 0.5 at 670 cm^{-1} and 5 at 4000 cm^{-1}. Photometric accuracy is 0.1 percent for any one reading, single beam. (Beckman Instruments, Inc., Dept. 619)

■ TEMPERATURE INDICATORS are disposable paper strips that respond to temperatures by exhibiting an irreversible color change. Strips are available for temperatures in the range 100° to 490°F. Response time is less than 1 sec; accuracy is ± 1 percent. (Paper Thermometer Co., Dept. 643)

■ HYPERTHERMAL WIND TUNNEL uses a plasma-jet head coupled to an evacuated chamber to produce thermal effects corresponding to those encountered at Mach 20. The plasma jet is formed by air heated in an arc chamber and produces a flow smoothed and shaped by a supersonic secondary nozzle, producing a test section diameter of 1 in. The equipment is capable of continuous operation. (Giannini Plasmadyne Corporation, Dept. 636)

■ MOTION ANALYZER provides digital output of coordinates of position on a film frame. A projected image is viewed on a screen 11 in. in diameter. After positioning the crosshairs and angle screen, the operator presses a button that causes the data to be read into a card-punch or printer. Readout is in increments of 0.001 in. at the magnified image, and angle is measured to 0.1 deg. (Vanguard Instrument Corp., Dept. 646)

■ CENTRIFUGES, available in three models, use a ball-disk drive system to obtain constancy of rotation, including wow and long-term drift, better than ± 0.05 percent. Speed is continuously variable from 0 to 800 rev/min. Speed measurement, accomplished with a 600-tooth disk and a magnetic pickup, enables direct readout of arm speed accurate to ± 0.01 percent. Accessories include closed television systems, high-pressure air and hydraulic systems, and servo control. Diameters of the three models are 30, 60, and 96 in. (Genisco Inc., Dept. 639)

JOSHUA STERN
National Bureau of Standards, Washington, D.C.