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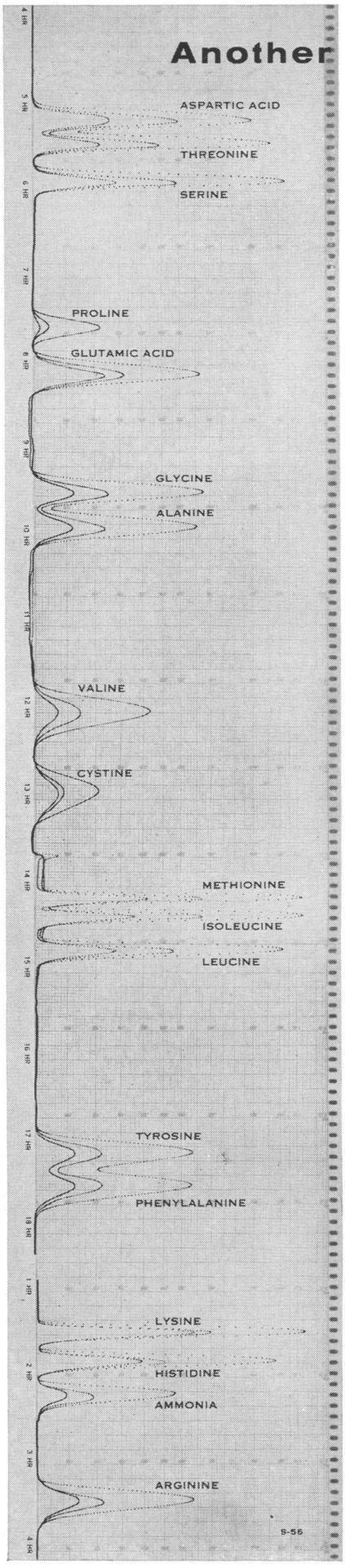
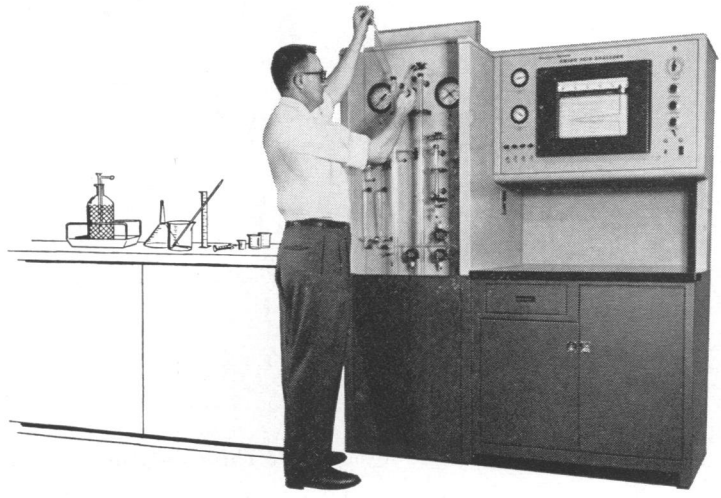


Another Advancement in Protein Research



Automatic
AMINO ACID ANALYZER

using Moore-Stein technique

Quantitative analysis of amino acids with the new Beckman/Spinco Amino Acid Analyzer saves as much as 80% of the time required by conventional chromatographic techniques. Analysis of a protein hydrolysate is completed in 24 hours—and because operation is virtually automatic, an operator need be available for only 3½ hours.

The instrument, based on the developments of Drs. Spackman, Stein and Moore of the Rockefeller Institute, uses ion-exchange chromatography to separate a mixture of amino acids. A color is formed continuously with ninhydrin reagent, and a built-in recorder plots color density on a chart. The concentration of each amino acid is then read from the chart. The method is applicable to a variety of ninhydrin-positive compounds, including components in physiological fluids, foods and tissues.

A typical chart from the Spinco Amino Acid Analyzer using the Moore-Stein technique is shown at left. The first run on acid and neutral amino acids required 18 hours; the 4-hour run on a second column recorded basic amino acids. More than twenty amino acids can be measured on the standard instrument, with an accuracy of 3 percent.

For literature on this new instrument, please write Spinco Division, Beckman Instruments, Inc., Stanford Industrial Park, Palo Alto, California. Ask for Bulletin MS-5I.

Reference: *D. H. Spackman, W. H. Stein, and S. Moore, "Automatic Recording Apparatus for use in the Chromatography of Amino Acids", Anal. Chem., 30, 1190-1206, 1958.*

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Science and *The Scientific Monthly*, 1953.

Clyde K. Kluckhohn, 53 (anthropology) assistant professor of anthropology, University of New Mexico, and research associate, School of American Research, 1932–34; instructor in anthropology, Harvard, 1935–37, assistant professor, 1937–40, associate professor, 1940–46, professor, 1946–, director, Russian Research Center, 1947–54; Lowell lecturer, Boston, 1944; Guggenheim fellow, 1945–46; Dyason lecturer, Australian Institute of Internal Affairs, 1952; fellow, Center for Advanced Study in the Behavioral Sciences, 1954–55; staff member, School for Overseas Administration, 1943–44; co-chief, Joint Morale Survey, Military Intelligence Service and Office of War Information, 1944–45; expert consultant to the Secretary of War, 1946–47; consultant, Research and Development Board, Department of Defense, 1948–54; consultant, Office of Indian Affairs, Department of the Interior, 1942–; member, Advisory Committee, Foreign Service Institute, Department of State, 1956–; president, American Anthropological Association, 1947; chairman, Division of Anthropology and Psychology, National Research Council, 1956–; trustee, Institute for Inter-Cultural Studies; trustee, Harvard-Yenching Institute, 1949–54; member, Scientific Advisory Board, Fels Institute; director, Association on American Indian Affairs; awarded Viking Medal for General Anthropology, 1950.

AAAS activities: member, Executive Committee, Section H, 1940–43, vice president and chairman, 1950.

Margaret Mead, 56 (anthropology), National Research Council fellow, 1925–26; Social Science Research Council fellow, 1928–29; assistant curator of ethnology, American Museum of Natural History, 1926–42, and associate curator, 1942–; visiting lecturer, Vassar College, 1929–41; director, Wellesley School of Community Affairs, 1944; visiting lecturer, Columbia University, 1947–54, adjunct professor, 1954–, director of research in contemporary cultures, 1948–52; visiting professor, University of Cincinnati, 1957–58; executive secretary, National Research Council Committee on Food Habits, 1942–45; consultant on mental health and member of research committee, Mental Health Division, National Advisory Mental Health Council, U.S. Public Health Service; president, World Federation for Mental Health, 1956–57; president, Society of Applied Anthropology, 1949; member, editorial board, *American Scholar*; secretary, Institute for Intercultural Studies, 1949; chairman, Section of Anthropology, New York Academy of Sciences.

AAAS activities: member, Board of Directors, 1955–58; member, Committee on Social Aspects of Science, 1957–; chairman, Nominating Committee, 1957.

Letters

Use of Twins in Epidemiological Research

The work of Osborne and Adlersberg on serum lipids in adult twins [*Science* **127**, 1294 (1958)] seems to us to be important, both because of the findings and because of the epidemiological method employed. We have therefore reviewed critically the experimental design and the results obtained.

One factor which is hard to assess in this study is the extent to which the sample is biased as a result of the difficulty of obtaining pairs of twins. It is clearly too much to expect that the subjects used will be selected at random from the target populations; the best one can do is to take available subjects, recognize the major sources of bias, and draw conclusions that are subject to the serious limitations imposed by these biases. For example, since the level of serum lipids changes with age [D. Adlersberg, *J. Am. Med. Assoc.* **162**, 619 (1956)], one would be cautious in making comparisons between any groups that differed in the distribution of ages. As some of the groups in this investigation were small and the age of the subjects ranged from 18 to 55 years, it may well be that age differences influenced the results obtained. Further, one would expect that, as age increased, twins would be more likely to live apart. If this occurred, the effect of environmental differences due to living apart would be partially confounded with differences due to age.

The authors classified twins into five main groups according to sex and zygosity; monozygous male, monozygous female, dizygous male, dizygous female, and dizygous of unlike sex. The numbers belonging to these groups at birth are approximately in the ratio of 1:1:1:1:2 [F. Sandon, *J. Roy Statist. Soc.* **120A**, 440 (1957)]. It is not essential that the population proportions should be preserved in the sample, provided that the sampling is representative, in each case, of the appropriate group. However, when, as in this instance, the proportions are changed considerably (the dizygous male group and the dizygous group of unlike sex, in the sample, are relatively small) and random sampling has not been explicitly applied, one becomes suspicious that selective factors might be operating. The same kind of point could be made by noting that the monozygous pairs outnumber the dizygous by 43 to 39, that female pairs are more numerous than males in the ratio of 46 to 27, and that the number of female pairs living together is the same as the number living apart; in each case the deviation from the corresponding population ratios is considerable.

Each of the five groups of twins described above was subdivided according to whether the twins lived together or apart. It seems likely that twins living apart would be relatively hard to enlist as subjects, and that those living apart who came into the sample might therefore be unrepresentative of their appropriate groups. The authors note that they obtained only two pairs of dizygous male twins living apart. In our experience, twins living together are likely to appear at the laboratory together, and thus to have blood drawn at the same time of day, under similar circumstances, and to have it analyzed in the same batches. When this happens, important sources of intrapair variance are controlled, and the data are not strictly comparable with data obtained in the absence of such controls.

A point in the analysis of the data calls for comment. In computing an interpair variance for 14 pairs of monozygous male twins living in the same house and for 5 pairs living apart, the authors used a common mean for the 19 pair averages and thus obtained 18 degrees of freedom for a pooled interpair variance. This procedure is biased in the direction of increasing the interpair variance in those cases where there is a difference between the means of the "together" and "apart" groups. Indeed, the conventional method of detecting a difference between the means of twins living together and twins living apart would be to test for nonrandom enlargement of the interpair variance as calculated by the authors. This potential bias resulting from differences in the group means is avoided if interpair variances are computed separately for the two groups, and subsequently pooled (unless they are significantly different).

The authors are to be congratulated on their attempt to develop a new approach to an important epidemiological problem. Publication of their full data, including the ages of the subjects, may resolve some of the problems discussed above. It does seem, however, that there are special difficulties in studying, in this way, an age-dependent variable such as serum cholesterol. These difficulties are not so acute when the variable under consideration is something like blood group or intelligence quotient, which does not vary with age.

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We appreciate the interest of White, Zalokar, and Pilot in our paper ["Serum lipids in adult twins," *Science* **127**, 1294 (1958)] and the opportunity of adding

a few remarks which could not be presented in a brief report.

It is well established that serum cholesterol and serum phospholipid levels are sex- and age-dependent variables. From previous studies [Adlersberg *et al.*, *J. Am. Med. Assoc.* **162**, 619 (1956)], it is known that in males there occurs a significant increase of total cholesterol and phospholipids in serum from age 20 to age 33 years. In females, however, these levels do not change significantly from age 2 to 32 years, but a significant rate of increase occurs from age 33 to 58. Although the ages of the subjects ranged from 18 to 55 years in our sample, the majority fell into the third and early fourth decades. The age differences between the two groups compared were small, for example, in monozygotic male twins, those living together had a mean age of 25.04 and those living apart, of 28.20, a difference of only three years. The greatest age difference was encountered in female dizygotic twins; those living together had a mean age of 20.56 and those living apart, of 33.23. In these age periods, serum lipids are not an age-conditioned variable.

We sympathize with the difficulties apparently experienced by White and his coworkers in obtaining twins living apart for simultaneous study. Because of the extreme importance of this precaution, the simultaneous physical and chemical examination of the two members of a twin pair was made a *conditio sine qua non* in our study. Rigid application of this principle often required many months of negotiation with the twin subjects. In addition, all specimens obtained were labeled by number, and their identity remained unknown to the laboratory personnel. Thus, any extrinsic effects upon intrapair variances were reduced to the practicable minimum.

In any epidemiologic study of man, sampling poses one of the most difficult problems. In the sampling of adult twins in good general health, the incidence of sex and zygosity at birth is of limited value. Greulich concluded, as early as 1934, that the number of twins in the general adult population was approximately 50 percent of the incidence at birth [*Am. J. Phys. Anthropol.* **19**, 391 (1934)]. It is now well established that the sex and zygosity differential of twins in adulthood is subject during life to marked modifications. (The sampling of the twin population under study is discussed in detail in a monograph by Osborne and DeGeorge, now in preparation).

We fully agree with White *et al.* on the method of analysis to be used, and what they suggest had, in fact, been done. In our study the average lipid levels in the various groups were calculated, compared, and found not to differ significantly. Interpair variances were calculated separately and found not to differ significantly, and subsequently they were pooled.

The method of study, as well as the evaluation of the data, is discussed in greater detail in our paper entitled "Serum lipids, heredity, and environment: A study of adult twins [*Am. J. Med.*, in press].

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Institute for the Study of Human Variation, Columbia University, New York, and *Departments of Medicine* and *Chemistry, Mount Sinai Hospital, New York*

Meetings

American Council on Education

The response of education in the United States to the sputniks and the challenges of the space age will be discussed by Arthur S. Flemming, Secretary of Health, Education, and Welfare, and other national leaders in education at the 41st annual meeting of the American Council on Education in Chicago, 9–10 October. The general theme, "Education Accepts New Challenges," will

be developed in the opening session at the Palmer House by Arthur S. Adams, president of the council, speaking on "A Clinical Look at the Controversy over Education," and by Virgil M. Hancher, president of the State University of Iowa, on "The New Challenges and How To Meet Them."

Other general session speakers include Nathan M. Pusey, president of Harvard University; Norman P. Auburn, president of the University of Akron; and Lawrence A. Kimpton, chancellor of the University of Chicago, who also is this year's chairman of the American council. The council's membership of 140 educational organizations and 1028 colleges and universities is expected to send nearly 1000 college presidents and other top administrators to hear the addresses and to participate in the discussion groups.

Pharmacology

At the fall meeting of the American Society for Pharmacology and Experimental Therapeutics, held at the University of Michigan, Ann Arbor, a resolution was introduced by Dr. Louis Goodman of the University of Utah, and President-Elect of the Society, commending the Past-President of the Society, Dr. Otto Krayer of Harvard, for his significant leadership of the Society in expanding its program of activity and in developing national headquarters in Beaumont House, Washington, D.C., in conjunction with the American Physiological Society. The resolution was adopted with acclaim. Chauncey D. Leake of Ohio State University presided, and Carl Schmidt of the University of Pennsylvania reported on medical education in Latin America. Bernard B. Brodie of the National Institutes of Health arranged a teaching institute on "Physicochemical Factors in Drug Disposition," and Leake held an informal discussion on teaching pharmacology to non-medical students. A total of 157 scientific reports were given in 16 sections, with emphasis on neuropharmacology and on cardiovascular and autonomic drugs.

Forthcoming Events

October

24–28. American Heart Assoc., San Francisco, Calif. (J. D. Brundage, 44 E. 23 St., New York 10.)

27–28. Child Research in Psychopharmacology, conf., Washington, D.C. (S. Fisher, Psychopharmacology Service Center, Natl. Inst. of Mental Health, Bethesda 14, Md.)

27–28. Plant Physiology, 9th annual research cong., Saskatoon, Saskatchewan, Canada. (D. T. Coupland, Plant Ecology

College of Agriculture, Univ. of Saskatchewan, Saskatoon.)

27–29. Radio, Institute of Radio Engineers, fall meeting, Rochester, N.Y. (V. M. Graham, EIA, 11 W. 42 St., N.Y.)

27–29. Weak Interactions, APS conf. (by invitation), Gatlinburg, Tenn. (J. L. Fowler, ORNL, P.O. Box X, Oak Ridge, Tenn.)

27–31. American Inst. of Electrical Engineers, fall general, Pittsburgh, Pa. (N. S. Hibshman, AIEE, 33 W. 39 St., New York 18.)

27–31. American Public Health Assoc., St. Louis, Mo. (B. F. Mattison, 1790 Broadway, New York 19.)

27–31. Metal Exposition and Congress, 40th natl., Cleveland, Ohio. (ASM, 7301 Euclid Ave., Cleveland 3.)

27–31. Vertebrate Speciation Conf., Univ. of Texas, Austin. (W. F. Blair, Dept. of Zoology, Univ. of Texas, Austin 12.)

27–1. Mental Health, 3rd Latin American cong., Lima, Peru. (B. Caravedo, Comite Peruano Organizador, III Congreso Latinoamericano pro Salud Mental, Avenida del Golf 1040, San Isidro, Lima.)

29–30. '58 Computer Applications symp., Chicago, Ill. (M. J. Jans, Armour Research Foundation, 10 W. 35 St., Chicago 16.)

30–31. Plastics, intern. symp., Philadelphia, Pa. (ASTM, 1916 Race St., Philadelphia 3.)

30–1. American Assoc. of Textile Chemists and Colorists, 37th natl. conv., Chicago, Ill. (J. G. Kelley, E. I. duPont de Nemours & Co., Inc., 7 South Dearborn St., Chicago 3.)

31–1. Central Soc. for Clinical Research, 31st annual, Chicago, Ill. (A. S. Weisberger, CSCR, Suite 1215, 25 East Washintgon St., Chicago.)

November

2–7. Radiology, 6th Pan American cong., Lima, Peru. (M. Lesonde, Inter-American College of Radiology, Tucuman 1516, Buenos Aires, Argentina.)

3–4. Italian Soc. of Nuclear Biology and Medicine, 3rd cong., Florence, Italy. (Segreteria della Societa Italiana di Biologia e Medicina Nucleare, Clinica Medica, Pisa, Italy.)

4. Use of 650 and 704 Computers for Structure Analysis, conf., Pittsburgh, Pa. (G. A. Jeffrey, Dept. of Chemistry and Physics, Univ. of Pittsburgh, Pittsburgh.)

4–7. American Soc. of Tropical Medicine, Miami Beach, Fla. (R. B. Hill, 3575 St. Gaudens Rd., Miami 33.)

4–11. International North Pacific Fisheries Commission, 5th annual (by invitation), Tokyo, Japan. (R. I. Jackson, 209, Wesbrook Building, Univ. of British Columbia, Vancouver 8, Canada.)

5–7. Society of Rheology, annual, Philadelphia, Pa. (W. R. Willets, Titaniaum Pigment Corp., 99 Hudson St., New York 13.)

6–7. Nuclear Science, 5th annual, San Mateo, Calif. (H. Pratt, IRE, 1 E. 79 St., New York 21.)

6–8. Geochemical Soc., St. Louis, Mo. (K. B. Krauskopf, Geology Dept., Stanford, Calif.)

(See issue of 19 September for comprehensive list)