similar shifts of spectral lines can be produced by some other phenomenon thus far unknown, perhaps the "aging" of light. For these reasons, it appears interesting to obtain some sort of independent evidence for or against the assumption that the galaxies recede from us (hypothesis of "expanding universe").

The three papers presented at the symposium dealt, essentially, with only the afore-mentioned two questions, or, more precisely, with the methods by which these two questions could possibly be solved. Up to the early 1930's the idea prevailed that the spatial distribution of galaxies is statistically uniform (*24*) except for occasional clusters. At present this idea is abandoned in favor of the idea of universal clustering. Thus clusters of galaxies become objects of independent studies. The first paper, by Fritz Zwicky, gave the first extensive collection of data regarding clusters. The second paper, by J. Neyman, E. L. Scott, and C. D. Shane was a summary of results obtained in a 5-year cooperation between the Lick Observatory and the Statistical Laboratory on the problem of distribution of galaxies. The empirical part of the study was based on the collection of plates taken by Shane and Wirtanen (*25*), which at the present time represents the most extensive and systematic material for statistical studies of galaxies. The theoretical part of the work included formulas characterizing the distribution of images of galaxies observable on the photographic plates both when the universe is static and when it is expanding. Roughly speaking, in the case of an expanding universe, the photographic plates would contain relatively more images of clusters with small angular dimensions than would be the case in the absence of expansion. Unfortunately, the formulas are quite complicated, and it will be some time before their numerical evaluation can throw some new light on the problem studied.

The third paper, by George C. McVittie, was closely connected with the theory developed in Neyman, Scott, and Shane's paper. If the observed shift of the spectral lines actually is caused by velocities of expansion, then one must admit that for distant galaxies these velocities are tremendous and the observable distribution of images of galaxies is likely to be affected by relativistic effects of transmission of light. Thus, McVittie's paper dealt with modifications of the original theory that appear necessary in the light of the theory of relativity.

References and Notes

1. *Proceedings of the Berkeley Symposium on Mathematical Statistics and Probability* (Univ. of California Press, Berkeley, 1949).
2. *Proceedings of the Second Berkeley Symposium on Mathematical Statistics and Probability* (Univ. of California Press, Berkeley, 1951).
3. J. Neyman, *First Course in Probability and Statistics* (Holt, New York, 1950).
4. R. A. Fisher, "The correlation between relatives on the supposition of Mendelian inheritance," *Trans. Roy. Soc. Edinburgh* 52, 399 (1918).
5. S. Wright, "The analysis of variance and the correlations between relatives with respect to deviations from an optimum," *J. Genet.* 30, 243 (1935).
6. K. Mather, *Biometrical Genetics* (Methuen, London, 1949).
7. O. Kempthorne, "The correlation between relatives in a random mating population," *Proc. Roy. Soc.* B143, 103 (1954).
8. C. C. Cockerham, "An extension of the concept of partitioning hereditary variance for analysis of covariances among relatives when epistasis is present," *Genetics* 39, 859 (1954).
9. E. R. Dempster and I. M. Lerner, "Heritability of threshold characters," *ibid.* 35, 212 (1950).
10. G. Pólya, "Sur quelques points de la théorie des probabilités," *Ann. inst. Henri Poincaré* 1, 117 (1930).
11. G. E. Bates and J. Neyman, "Contributions to the theory of accident proneness: II, True or false contagion," *Univ. Calif. Publ. in Statistics* 1, No. 10, 255 (1952).
12. G. E. Bates, "Contribution to the study of contagion," *Ann. Math. Stat.*, in press.
13. J. Yerushalmy, "Statistical problems in assessing methods of medical diagnosis, with special reference to x-ray techniques," *Public Health Repts. U.S.* 62, (1947), 1432 (1947).
14. J. Neyman, "Outline of statistical treatment of the problem of diagnosis," *ibid.* 62, 1449 (1947).
15. C. L. Chiang, "On the design of mass medical surveys," *Human Biology* 23, No. 3, 242 (1951).
16. H. Muench, "The probability distribution of protection test results," *J. Am. Statistical Assoc.* 31, 677 (1936).
17. A referee warns me that in spite of the fictitiousness of the figures in Table 1 and in spite of the emphasis on the methodological character of my remarks, the "tobacco people" may pick up the argument and use it for publicity purposes. I most sincerely hope that this does not happen. The purpose of this note is to reemphasize that my comments were prompted by what appears to be insufficient attention given to the distinction between the prospective and the retrospective studies. As to the validity or otherwise of the assertions regarding the incidence of cancer of the lung among smokers and among nonsmokers, I have no direct information.
18. R. R. Bush and F. Mosteller, *Stochastic Models for Learning* (Wiley, New York, in press).
19. G. A. Miller and W. J. McGill, "A statistical description of verbal learning," *Psychometrika* 17, 369 (1952).
20. C. Graham and R. M. Gagne, "The acquisition, extinction, and spontaneous discovery of a conditioned operant response," *J. Exptl. Psychol.* 26, 251 (1940).
21. R. L. Solomon and L. C. Wynne, "Traumatic avoidance learning: acquisition in normal dogs," *Psychol. Monogr.* 67, No. 354 (1954).
22. T. R. Wilson and R. R. Bush, personal communication.
23. O. Struve, *Stellar Evolution* (Princeton Univ. Press, Princeton, N.J., 1950).
24. E. P. Hubble, "Effects of red shifts on the distribution of nebulae," *Astrophys. J.* 84, 517 (1936).
25. C. D. Shane and C. A. Wirtanen, "The distribution of extra-galactic nebulae," *Astronom. J.* 59, 285 (1954).

Wendell M. Latimer, Chemist

Wendell Mitchell Latimer was one of Gilbert N. Lewis' more important selections when he was building his chemistry department at the University of California. Latimer had an important part in shaping the department and succeeded Lewis as dean of the College of Chemistry at Berkeley. Chemistry lost one of its more versatile and prolific contributors on 6 July 1955 at the age of 62. Weakened by successive gall-bladder operations, Latimer appeared to be recovering satisfactorily when a recurrence of the difficulty weakened him further and he died in his sleep. He leaves his wife Glatha (Hatfield) Latimer, a son Robert Milton Latimer, who is a student of chemistry, a daughter Mrs. Eleanor L. Colborn and two grandchildren Diane and Robert Edgar Colborn.

Latimer was born in Garnett, Kansas, 22 April 1893, the only son of Walter and Emma Mitchell Latimer. He entered the University of Kansas, planning to become a lawyer. He found that he enjoyed mathematics and sought some subject to which he might apply it. His first contact with chemistry came during his third year at the university. The subject captured his interest and he decided to become a chemist. He was partly self-supporting as a student and was employed to make meteorological observations. He received the B.A. degree from the University of Kansas in 1915 and served as instructor there from 1915 to 1917. Latimer came to Berkeley as a graduate student because of G. N. Lewis' reputation and his study of some of Lewis' papers. In 1919 he received the Ph.D. degree from the University of California. His research, under the direction of G. E. Gibson, was concerned with low-temperature calorimetry. He was retained as a member of the staff and attained the full professorship in 1931. He served as assistant dean of the College of Letters and Science, 1923–24, as dean of the College of Chemistry 1941–49, and chairman of the department of chemistry 1945–49. He was Guggenheim Memorial Foundation fellow in Munich in 1930. He was associate editor of the *Journal of Chemical*

Physics 1933–35, associate editor of *Chemical Reviews* 1940–41, and since 1937 editor of the Prentice-Hall Chemical Series.

Latimer was active in the National Defense Research Committee from 1941 to 1945 in the fields of oxygen production, chemical warfare, and plutonium research. He was director of a Manhattan Engineering District project in the department of chemistry on the chemistry of plutonium from 1943 to 1947, and since that time he has served as associate director of the Radiation Laboratory of the University of California at Berkeley for chemistry. He also supervised considerable war work on the effect of meteorological conditions upon the behavior of toxic gases. This activity led him to England in 1943 and to Panama, Australia, and New Guinea in 1944. After World War II he served as a member of the Office of Naval Research Panel on Research Contracts on Chemistry 1949–52, of the Special Weapons Panel of the Atomic Energy Commission 1947–51, and of the Army Chemical Research Board 1946–51.

Latimer was a member of the National Academy of Sciences, serving as chairman of the chemistry section 1947–50; American Chemical Society; Electrochemical Society; Faraday Society; American Association for the Advancement of Science; American Academy of Political Science; Sigma Xi; and Alpha Chi Sigma.

Latimer's some 100 scientific contributions are largely concerned with the application of thermodynamics to chemistry. However, he worked on such diverse subjects as dielectric constants, coefficients of expansion at low temperatures, thermoelectric effect and electronic entropy, the ionization of salt vapors, radioactivity, and astrochemical problems in the formation of the earth. His long-continued and major interest involved the measurement of low-temperature calorimetric properties and the use of the third law of thermodynamics to determine the entropies and free energies of aqueous ions. This work supplied much of the material included in his outstanding book *Oxidation Potentials,* first published in 1938 and revised in 1952. He also co-authored the books *A Course in General Chemistry,* with W. C. Bray and *Reference Book of Inorganic Chemistry,* with J. H. Hildebrand.

One of Latimer's early and important contributions was his paper with W. H. Rodebush on the hydrogen bond. His was the first recognition of this bond as a general phenomenon in which a proton is held between two electronegative atoms. The properties of numerous organic and inorganic substances, including water, are largely determined by hydrogen bonding. The basic idea has found wide and rapidly increasing application. For example, in Linus Pauling's book *The Nature of the Chemical Bond,* some 50 pages are devoted to the discussion of examples of hydrogen bonding, and he states: "I believe that as the methods of structural chemistry are further applied to physiological problems it will be found that the significance of the hydrogen bond for physiology is greater than that of any other single structural feature."

Latimer spent a large amount of his time helping others, and he had a stimulating effect on his colleagues and students. For example, he was mainly responsible for initiating a seminar on nuclear chemistry which interested such men as Libby, Seaborg, Wahl, and Kennedy in that subject and helped lay the foundation for the discovery of plutonium. The first separation and identification of the new element plutonium depended on the relative oxidation potentials of the heaviest elements, and the fact that Latimer was the world's foremost expert on oxidation potentials and was available for oral consultation contributed heavily to the discovery of this extremely important element. During my own early research years, I worked in the laboratory beside Latimer, and for some years following 1922 I shared his office at his invitation. It was during this period that I learned many of the facts concerned in gas liquefaction by watching Latimer build and operate the first successful hydrogen liquefier in the United States and extend research to these temperatures. This obviously had its effect on my later low-temperature work, and these recollections, along with our 36 years of association, leave me with a deep sense of personal, as well as scientific, loss.

No department can attain and maintain a position of first rank unless it has talented students. During the last two-thirds of the G. N. Lewis period at Berkeley, and during his own administration, Latimer was the talent scout of the department. He was expert at detecting signs of originality in graduate students seeking admission or invited to seek admission. Those admitted rarely failed to obtain results that produced a happy situation for all concerned. Latimer was administrative head of his department during the inevitable period of expansion following World War II. In this period he enlarged his faculty by a group of young men who have considerably broadened the range of research activities and who are maintaining the distinguished research position of the department.

Latimer received the United States Presidential Certificate of Merit for his contributions during World War II and the Distinguished Service Award of the University of Kansas, both in 1948. He was Faculty Research Lecturer of the University of California in 1953 and received the Nichols Medal of the American Chemical Society in 1955.

At the time of his death he was looking forward to attending meetings of the International Congress of Pure and Applied Chemistry in Zurich, Switzerland, and the International Conference on the Peaceful Uses of Atomic Energy in Geneva later this year. His sound judgment, influence and research activities represent a loss that will not soon be compensated.

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My father took me sometimes to see masons, coopers, braziers, joiners, and other mechanics, employed at their work, in order to discover the bent of my inclination, and fix it if he could upon some occupation that might retain me on shore. I have since, in consequence of these visits, derived no small pleasure from seeing skillful workmen handle their tools; and it has proved of considerable benefit to have acquired thereby sufficient knowledge to be able to make little things for myself, when I have had no mechanic at hand, and to construct small machines for my experiments, while the idea I had conceived has been fresh and strongly impressed on my imagination.—BENJAMIN FRANKLIN, *Autobiography.*