a household article, it seems desirable to have a shorter name for it.

The tendency to abbreviate a long word is almost irresistible. It has sometimes been convenient to use the initials p.a. to designate the substance, but these same initials are used by medical men to mean pernicious anemia, and by physiologists to designate pyruvic acid.

It is suggested that especially for popular and semi-popular use the term *pantothen* be used as a substitute or abbreviation for the longer name.

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## WANTED—SEDIMENTARY GALENAS

As may be seen from the abstract of A. O. Nier's work (University of Minnesota) included in the mimeographed edition of the "Report of the Committee on the Measurement of Geologic Time" just issued, especially pages 58–59, there is some indication that the age even of a common ore mineral like galena can be obtained from the proportion of isotopes in it, that the primal lead is indicated by the $Pb^{204}$ and that the younger lead has a little larger proportion of the other isotopes which may be produced by radioactive disintegration which must be going on during geologic time.[1]

It will be noticed, however, in the results given on Table 2 that the galenas of Joplin, Missouri, have a relatively high proportion of the isotopes which may be of radiogenic origin. Just how this comes to be is a matter which needs further investigation, and while there are other matters of more importance at present, it would be well to get material ready for an investigation later. Galenas from other sedimentary occurrences, not only those in the three Missouri districts but in the Mississippi, or other sedimentary formations where the occurrence and geology is well known, would be desirable. If some of these occurred in connection with barite the facts should be noted.

Rarely, however, galena also occurs in the center of balls and septaria of siderite, clay iron stone, sometimes known as nigger head, and it might be possible to get valuable results from even two grams of such material. We hope that any such material will be kept for further scientific research and the Committee on Measurement of Geologic Time will be glad to know about it.

ALFRED C. LANE

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## COLLECTION AND FILING OF SCIENTIFIC DATA

IN SCIENCE, issue of September 19, 1941, page 278, Alfred H. Taylor of the Experimental Research Laboratories, Burroughs Wellcome and Co., U. S. A., Tuckahoe, N. Y., suggests the collection and filing of data on absorption spectra at some central depository in order to make them easily available for all research workers. He points out how widely scattered the literature on absorption spectra is and how inconvenient it sometimes proves to obtain the data wanted even if they have been known for a long time. To avoid waste of time and money he proposes what may be called a sort of clearing-house outlining at the same time a working scheme for such an institution.

It may be of interest that in another field of science, human genetics, where the difficulties encountered are very much like those mentioned by Taylor, such a clearing-house dealing with genetical data in man has been set up by the Bureau of Human Heredity, 115 Gower Street, London, W. C. I., some years ago and has met with ever-growing success. The working methods of this institution are exactly like those described by Taylor (with the only exception that there is no charge for information) and have proved so efficient that, on request of many research workers, the Bureau of Human Heredity has resolved to make use of its methods for some special tasks—*e.g.*, a survey on constitutional factors in cancer.

For this latter part of its activities the Bureau of Human Heredity has kindly been given hospitality by the Genetics Laboratory, Ohio State University, so that the work is now carried on in close cooperation by both institutions. The collection of data, although of course somewhat hampered by the conditions of war in Europe, is growing rapidly, owing to the interest of scientists all over the world; services may be expected to be available for all those interested in this field by next summer.

FR. BLANK

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LONDON; GENETICS LABORATORY,
THE OHIO STATE UNIVERSITY

# SCIENTIFIC BOOKS

## PAPERS OF WADE HAMPTON FROST

*Papers of Wade Hampton Frost, M.D.; A Contribution to Epidemiological Method.* Edited by KENNETH F. MAXCY. viii + 628 pp. Illustrated. New York: Commonwealth Fund. $3.00. 1941.

RARE is the demand for republishing articles from professional and official periodicals and bulletins, and unusual the honoring of an author by assembling after his death the significant contributions he made in medical literature to contemporary fact, method and thought. We have in hand a volume, dignified and pleasing in form, edited by men of superior discern-

[1] See also paper by Nier, Thompson and Murphey, *Physical Review*, July 15, 1941, Vol. 60, pp. 112–116.

ment with the devotion of life-long friendship and enduring admiration for the author.

To Wade Hampton Frost, student, administrator and teacher of epidemiology, we owe the flowering of this relatively new discipline of preventive medicine in the United States. The twenty papers selected for the distinction of this volume from among the sixty items of his bibliography reveal the initiation of novel inquiries, the interpretation of significantly correlated facts and the inductive and deductive reasoning by which Frost made an impression upon the science and practice of epidemiology and its public application to preventive medicine in our time.

An introduction, five sections under which the twenty papers are assembled by topics or stages of thought and objective, a bibliography and an index are included in the 628 pages of this book.

Quite apart from and in addition to the satisfaction of having in convenient form these classical studies of particular epidemics, their causes and control, the observant reader will gain from the related sections a sense of the passing of a simple descriptive epidemiology by its development into an elaborate constructive science built upon many others, and valuable as an intellectual exercise, an educational discipline and an analytical procedure of ever-expanding usefulness in determining attitudes and policies of personal and public medicine.

Frost's admiration for the demographic studies of Hirsch ("Historical and Geographic Pathology"), for the accurate observations, precise statements, the confidence, courage and logical reasoning of Snow ("On Continuous Molecular Changes," and "On the Mode of Communication of Cholera"), for Budd ("Typhoid Fever") and Panum ("On Measles") and for the studies and reports of Chapin of Providence, set goals of a perfection of presentation and deduction which he alone among American epidemiologists can be said to have achieved.

In the twenty pages of introduction by the editor, Kenneth F. Maxcy, himself a notable discoverer of new facts in epidemiology and a worthy successor to Dr. Frost as teacher, we learn of those origins and ways of life, family influences and professional experiences which had their share in affecting the directions of interest, the loyalty to scientific method and the precise ordering of evidence and its description characteristic of this man, whose thoughts and counsel drew to him a generation of eager colleagues and devoted friends.

Like many another notable commissioned officer of the U. S. Public Health Service, Frost had a varied training in hospital and field, office and laboratory, moving as orders required from one danger point to another where public need or an opportunity for evidence called him. To have shared in the first successful abatement of yellow fever in New Orleans in 1905 must have been an exhilarating experience. Coast Guard cruises off New England and to European, South Atlantic and West Indies ports, followed by assignment to the Hygienic Laboratory for several years, prepared Frost for his early studies on typhoid fever and the initiation of a life-long concern with, and constructive development of stream pollution studies in the Ohio River basin and elsewhere. Then came his studies of epidemics of poliomyelitis, of which his descriptions set a standard of thoroughness and honesty for all later authors and reports.

The pandemic of influenza of 1918 called for new methods, painstaking techniques and a broad imagination, which Frost supplied.

From 1919 until his death in 1938 Dr. Frost's life was as professor of epidemiology at the School of Hygiene and Public Health of the Johns Hopkins University, the first such department and position in this country, and in these twenty years his influence was felt wherever the mass phenomenon, the natural history of disease as it occurs among peoples related by one or more common factors, is studied, taught or practiced.

The three papers in Section One range widely from the self-evident, the obvious or almost routine to the most confusing and obscure problems of epidemic disease. It was almost a foregone conclusion that the typhoid fever and diarrheas of Williamson and the Tug River watershed in West Virginia were causally related to the pollution of water supplies by sewage. A simple situation, characteristic of the great majority of small towns and even of many of our large cities in 1910, offered an easy solution. There is an adequacy of evidence, sound reasoning, a reasonableness and comprehensiveness of conclusions and recommended measures for prevention that reveal the competence of this first report of the field epidemiologist.

In the paper on "Septic Sore Throat," in Baltimore, again a relatively common occurrence, though less often identified in 1912 than in later years, a model is given of the way to approach an acute or explosive episode of that type. The best of modern practice in controlling milk-borne streptococcus sore throats has not gone beyond the procedures advised by Frost almost thirty years ago, and every alert local health officer makes the same series of observations and uses the same reasoning now when faced with similar episodes.

In the third, a monographic paper on poliomyelitis, there are assembled the basic reports of epidemic expression of this disease in rural Iowa, 1910, in Cincinnati, Ohio, 1911, and near Buffalo, New York, in 1912. Frost as a clinical observer sets a pattern of

classification of the disease, practically useful, and generally followed to-day. No subsequent outbreaks have been recorded with more effective testimony as to direct contact transmission, as to factors of distribution and the significant items of selection of the disease. We see here that comprehensive mastery of all the evidence and the ability to keep in their relative importance each factor of probable or possible bearing on origin, spread or termination of an epidemic, so characteristic of all Frost's contributions. Taken together with Bulletin 91, which followed in 1918 and recorded the national experience with the wide-spread epidemic of 1916, this paper (Hygienic Laboratory Bulletin No. 90) remains the essence of our knowledge of the epidemiology of poliomyelitis.

Section Two includes three brief papers dealing with the systematic study of stream pollution and water purification. In the first are the basic criteria applicable to measuring and expressing the sanitary quality of water supplies. The second deals with the history of increasing pollution of surface water supplies of many of our growing cities and the effect of measures initiated by sanitary engineers to purify them. The third paper is Frost's contribution to a notable symposium reviewing a decade of field and laboratory investigations in the Ohio River valley, and fully justifying the persistent concentration of the attention of the U. S. Public Health Service upon problems of technical laboratory methods, of measuring the efficiency of filtration plants and of the natural process of purification of streams.

In Section Three we meet for the first time instances of that initiation, testing and trust of new methods and techniques in the study of the prevalence and characteristic distribution of several acute communicable diseases in their endemic expression for which Frost's later papers became notable.

The descriptive epidemiology of influenza and studies upon frequency of its attacks, case incidence and fatality and other data obtained by the canvassing method applied to characteristic samples of population, all exhibit the careful planning, thorough checking and verification and scrupulous honesty of analysis and interpretation which were inherent in any undertaking with which Frost was associated.

There follow three papers on the common cold, acute minor respiratory diseases and the reciprocal relations of these to influenza in epidemic and non-epidemic form. Each of these deals with the observation of selected groups of intelligent people over long periods (eighteen to thirty months) by reports at relatively short intervals, calling for new methods for handling a mass of quantitative material. In the fourth and fifth papers Frost deals with inspection, immunity, morbidity and carrier prevalence of diphtheria on the basis of comparable information in two well-separated periods of years in Baltimore. He seems to have settled at least for our time the three major factors accountable for the striking reduction in morbidity from diphtheria and their relative importance mathematically expressed.

Section Four gives us Frost's description of epidemiology, for philosophical and educational uses, his renaissance of Chapin's remarkable studies and methods of discovering the truth about the secondary attack rate among family or household contacts, paying loyal tribute to the genius and clarity of mind and expression of that pioneer in the practical administrative use of systematic epidemiology.

In the third and fourth papers Frost communes as it were with his associates in public health, and shares with them some of the limitations he has found inherent in the process of accounting for performance of public health services, cautioning the health officer to make no claims without ample evidence and logical reasoning, demanding of the administrator the same critical evaluation of causes and effects as is expected of the laboratory experimenter, the clinician, the statistician. His discussion of authoritative standards and a suitable method of arriving at them by a professional body has made a permanent impression upon the representative committees of the American Public Health Association and can well be taken to heart by other organizations devoted to science and the public weal.

Finally in Section Five we have three papers of the highest order, from the point of view of technical epidemiology or for their worth as permanent contributions to knowledge with prophetic implications. "Risks of Persons in Familial Contact with Pulmonary Tuberculosis," "Age Selection of Mortality from Tuberculosis in Successive Decades" and "How Much Control of Tuberculosis?" are a triad of texts indispensable to any critical analyst of the whither and how of the prevention of this disease.

A thoughtful and illuminating addendum to the bibliography of Frost's own papers is a list of twelve unpublished theses on tuberculosis by his students, now distinguished in their own right by public performance, and eight published papers on tuberculosis and rheumatic fever by the same and other collaborators.

The index is adequate, convenient and suitably brief.

This sampling of the most notable and characteristic products of the labor and thought of Wade Hampton Frost is a testament to which his successors in an indispensable science will turn for inspiration and discipline. The fortunate few who were blessed with his companionship for however short an experi-

ence will read through the lines of exquisitely expressed thoughts, and among the tables and charts of tested data, and recall the warmth, the nobility of presence, the generosity of attention and interest for others, the gentleness of his searching wit, the pervading wisdom of the man whose authorship is warrant of his distinction.

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# SPECIAL ARTICLES

## STUDIES ON INHIBITION OF FERMENTATION BY YEAST MACERATION JUICE

FERMENTATION of glucose by yeast maceration juice is dependent on the quantity of inorganic phosphate present and the state of activity of the juice. This dependence was studied by the manometric method of Warburg. The time of induction, the maximum rate of fermentation and the quantity of $CO_2$ formed served to characterize the course of the fermentation.

Addition of phosphate prolongs the time of induction and decreases the maximum rate of fermentation, and is generally followed by a diminution of $CO_2$ formation. Addition of phosphate augments the quantity of $CO_2$ formed only if the quantity of phosphate present is not sufficient to satisfy the equation of Harden. The inhibition by phosphate is different from that by fluoride, which does not prolong the induction period, although it may increase the inhibitory effect of phosphate. The inhibition by phosphate is independent of the quantity of substrate but increases with decreasing concentration of maceration juice.

A "pre-fermentation" reduces the inhibitory effect of phosphate. The inhibition is also reduced if the phosphate is added during the course of fermentation. The inhibition is least if the addition takes place during the period of maximum rate of fermentation.

The addition of acetaldehyde reduces the phosphate inhibition. A certain amount of acetaldehyde has an optimum effect. On the other hand, if fermentation is inhibited by phosphate, accumulation of acetaldehyde during the fermentation is greatly diminished.

Pyocyanine and cytochrome C + cytochromoxidase give a similar reduction of phosphate inhibition. In these cases a consumption of $O_2$ takes place, which, however, is very small in comparison with the additional formation of $CO_2$. The $O_2$-consumption is not inhibited by phosphate; on the contrary it is somewhat increased in the presence of higher phosphate concentrations.

To localize the interference by phosphate, decarboxylation of pyruvic acid and the formation of phosphoglyceric acid were examined. These processes were not inhibited by high quantities of phosphate, but were rather promoted by them. Analyses for phosphoglyceric acid revealed that its formation during the fermentation is inhibited by phosphate in the same degree as is the fermentation. After addition of acetaldehyde, however, its formation sets in nearly immediately and is not depressed following addition of phosphate.

The phosphate inhibition evidently affects one or more of the slower links following the formation of phosphoglyceric acid, rendering them still slower. In this way it inhibits the formation of acetaldehyde necessary to oxidize glyceric aldehyde phosphoric acid. Both the fact that phosphate renders the oxidation of glyceric aldehyde phosphoric acid more complete and the greater deficiency of acetaldehyde in the presence of more phosphate seem to be responsible for the greater $O_2$ consumption in the presence of pyocyanine or the cytochrome system.

The different degrees of inhibition obtained in the various periods of fermentation or after a "pre-fermentation," can be explained by varying formation and accumulation of acetaldehyde and by the different speeds of the inhibitable links.

The inactivation of the maceration juice, which depends on age, temperature and dilution, decreases fermentation in the same manner as the addition of phosphate. The rate of the inactivation is greater, the lower the concentration of the juice. It is not based upon a monomolecular reaction. During the first stages of inactivation (which may be rather prolonged at low temperatures or scarcely demonstrable in the neighborhood of 40° C.) the activity remains constant. In later stages the inactivation is accompanied by turbidity formation. During the inactivation an augmentation of susceptibility to phosphate inhibition takes place, whereas the inhibition by fluoride or monoiodacetic acid is not similarly augmented.

In the presence of phosphate the inactivation and the formation of turbidity are retarded. It may be supposed that the original phosphate content of the juice acts as a stabilizer against inactivation.

The addition of acetaldehyde reduces the effects of the inactivation as well as does a short "pre-fermentation." This indicates that the enzyme is able to reactivate itself to a certain degree by the fermentation process.