NATIONAL ACADEMY OF SCIENCES

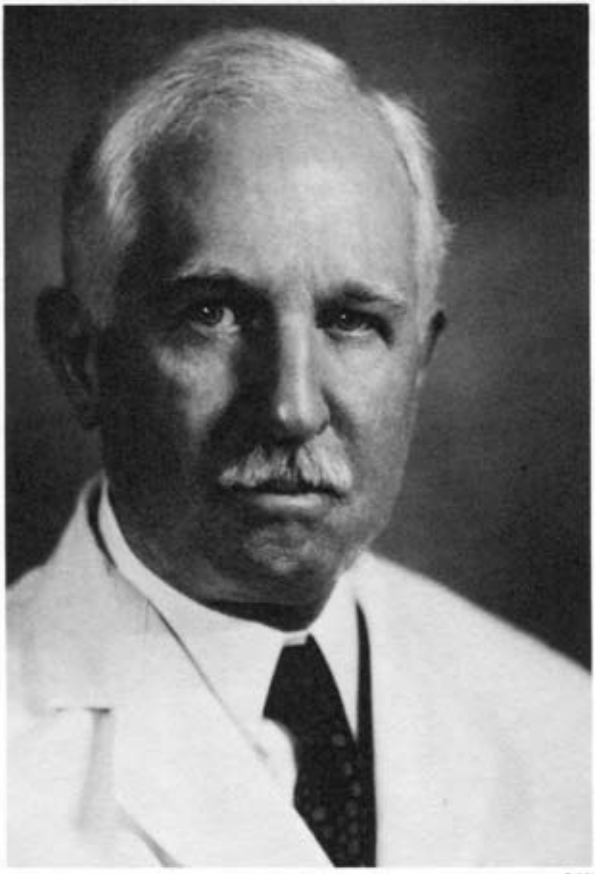
RUFUS COLE

1872—1966

A Biographical Memoir by

C. PHILLIP MILLER

Biographical Memoir



1937

Rufus Cole

RUFUS COLE

April 30, 1872–April 20, 1966

BY C. PHILLIP MILLER

RUFUS COLE, the first Director of the Hospital of the Rockefeller Institute for Medical Research and a pioneer in the development of clinical research, was born in Rowsburg, Ohio on April 30, 1872, the son of Ivory Snethen and Ruth Smith Cole. His father was a physician, as were two uncles. They and a fourth brother all served in the Union Army during the Civil War, Rufus' father as a contract doctor in Cincinnati. One uncle was killed in the conflict.

Cole's paternal ancestry was typically Yankee. James Cole had emigrated from England to Plymouth, Massachusetts in 1633. Succeeding generations lived in various places in New England, gradually moved west, and finally settled in Peru, Illinois. Cole's mother's family, the Smiths, also of Yankee stock, had lived in Ohio for several generations.

Rufus' father practiced medicine in Peru and the adjoining town of La Salle, Illinois. In his later years, Cole often recounted to his family his recollections of calls made with his father to visit patients in those towns, a boyhood experience that influenced him to become a physician. Rufus' mother encouraged him in his determination to continue his education beyond high school, although that required him to earn money as best he could to pay for it. In 1892 he entered the University of Michigan in Ann Arbor, where he graduated in 1896. He had origi-

nally intended to stay in Ann Arbor to study medicine, but in 1893 he was so impressed by an exhibit of the Johns Hopkins Medical School he chanced to see at the World's Columbian Exposition in Chicago that he changed his plans. Subsequently, he applied for admission to that school, and was accepted.

At the Hopkins, he came under the influence of William H. Welsh, William Osler, Lewellys F. Barker, and other celebrities on the faculty at that time. After his graduation in 1899, he was appointed to the resident staff of the Johns Hopkins Hospital and served his first year under Osler, for whom he retained an abiding admiration. This was Osler's last year before leaving Baltimore to become the Regius Professor at Oxford. Osler was succeeded by Barker, who, unlike his predecessor, was an advocate of the full-time system. Before he became Professor of Medicine at Johns Hopkins, Barker had begun a scientific career in anatomy at the University of Chicago. He had furthermore been much impressed by the excellent research he had seen in the great German university clinics. It was while he was still working in the Department of Anatomy at Chicago that Barker, in a speech at a dinner meeting of Hopkins alumni, advanced the novel idea that professors in the clinical disciplines should devote "whole time" to their academic duties and be relieved of the necessity of engaging in private practice.

When Barker succeeded Osler as Professor of Medicine, he began to establish laboratories adjacent to the wards and encouraged his house staff to engage in research employing scientific methods of the basic disciplines, thereby initiating a promising advance in American medicine. Never before had hospital laboratories served as more than convenient places in which to make routine diagnostic tests.

Cole was the first man appointed by Barker to take charge of one of the laboratories—the one designated the biological laboratory—and he proceeded to carry out a systematic clinical and bacteriological study of typhoid fever, a disease prevalent

in Baltimore at that time. By culturing the blood of patients, he showed that typhoid bacilli were present early in the disease. This work attracted considerable attention because it had been carried out in a routine clinical laboratory. It started a program which was to grow as Barker had hoped and eventually contributed significantly to the development of clinical medicine in America.

Cole stayed on at the Hopkins Hospital until 1909, rising in rank with each succeeding appointment. In those days such long terms of residency training were not unusual at the Hopkins, providing the incumbent was a man of exceptional promise, as was Cole. He spent the year 1903–1904 at Robert Koch's Institut für Infektionskrankheiten in Berlin working in the laboratory of Professor Wassermann, and published a paper on the differential agglutinability of different strains of typhoid bacilli.

In 1908 Cole was married in La Salle, Illinois to Annie Hegeler, whom he had known ever since they were childhood schoolmates. It was an exceptionally happy marriage, to which were born three daughters: Camilla Ruth (Mrs. Thomas R. Smidt), Elizabeth Anne (Mrs. William G. F. Botzow), and Mary Hegeler (Mrs. Mary Cole Childs).

Mrs. Cole was the daughter of Edward Carl Hegeler, a metallurgical engineer born and trained in Germany, who with Frederick Matthiessen constructed in La Salle the first successful zinc smelter in America and established the Matthiessen and Hegeler Zinc Company, which quickly became a very prosperous enterprise. Hegeler was not only a successful mining engineer, but also a serious student of philosophy and religion who, in 1887, founded the Open Court Publishing Company, which has published many books in those fields and issued the periodicals *The Open Court* and *The Monist*, the latter of which is still being published.

Later in 1908 Cole was appointed the first Director of the Hospital of the Rockefeller Institute for Medical Research. Al-

though the Hospital was not to be opened until two years later, Cole immediately began to formulate his plans for its organization and, more importantly, for its purpose, which was to advance the scientific study of clinical medicine. In 1909, in order to gather ideas for his hospital, Cole, accompanied by Mrs. Cole and their baby daughter, went abroad to observe the work going on in the university clinics in Britain and on the Continent.

The beginnings and development of the Rockefeller Institute have been admirably described by George W. Corner in his *History of the Rockefeller Institute 1901–1953* (New York: Rockefeller Institute Press, 1964). It was the Reverend Mr. Frederick Taylor Gates who first aroused John D. Rockefeller's interest in establishing an institute for medical research. Mr. Gates, ever since his pastorate in Minneapolis, had been obsessed by the need for better medical care for the sick. Furthermore, his perusal of Osler's famous textbook had shown him how many diseases were imperfectly understood and convinced him of the importance of supporting research in clinical medicine.

During several years at the turn of the century, a Board of Trustees for the Institute was assembled, a procedure to which Mr. Rockefeller and his son John D. Rockefeller, Jr. devoted much thought. In 1902 Dr. Simon Flexner was appointed Director of the Institute, and in 1904 work was begun in rented quarters which served as laboratories until the completion of the first of the new buildings at their present site on York Avenue.

From the beginning, the Trustees had planned for a small hospital where a few patients might be studied intensively, for, as Dr. Flexner had mentioned in one of his plans for its organization, "the Institute should never lose sight of the immediate problems of human disease" and "there should be attached to the Institute a small hospital for the study of special groups of disease" (Corner, p. 89). The number of beds was finally set at fifty.

Cole persuaded the Trustees to adopt the "full-time" system, which meant that the Hospital should have no "attending physicians," i.e., physicians who earned their living in private practice. Cole insisted that his staff should be composed of men dedicated to the scientific study of human disease. They were to be clinicians competent not only to care for patients suffering from a particular disease, but also competent to carry out such laboratory investigations as might throw light on that disease, and they were to be paid salaries which would permit them to do so.

Although the Institute already housed laboratories in which distinguished scientists were busily engaged in research on their several problems, Cole insisted that his hospital be provided with its own laboratories so that his clinicians could pursue their investigations close to the wards which housed their patients. To this end, the most modern equipment was installed, not only for the laboratories but for the care of patients as well. Provision was also to be made for quarters for experimental animals.

It was a bold plan, one which envisioned the establishment of a hospital altogether unique at the time, and which, incidentally, was very expensive to operate. But Rockefeller was persuaded by his son to provide an endowment adequate for its support. One stipulation was made: patients were never to be charged for their hospital care.

The Hospital opened in October 1910 with beds for fifty patients. In order to avoid the problems of the customary nurses' training school, the entire nursing service was in the hands of salaried graduate nurses.

In planning the living quarters for his house staff, Cole did not forget the wisdom of John Shaw Billings, who, in designing the buildings of the Johns Hopkins Hospital, had allocated for the house staff spacious bedrooms with a pleasing outlook and with a library close at hand. Cole was thus able to offer his resident physicians very comfortable quarters with a bedroom

apiece; an office for the head resident; a dining room where they ate breakfast and dinner; and a lounge, containing a small library, in which afternoon tea was always served—a pleasant occasion for informal discussion which often resulted in profitable exchange of ideas. For their midday meal the Hospital staff went to the lunch room in the main building and joined the men working in the laboratories of the Institute, an arrangement that afforded opportunity for friendly personal contact with some of the most distinguished scientists in America.

The staff of the Hospital worked together as a congenial and scientifically productive group. A telling indication of their respect and affection for Dr. Cole is the fact that, in speaking about him, they always referred to him as "the Director." Among the residents it was no secret that the comforts afforded them were designed to encourage them to postpone marriage and continue their scientific development. "Poverty and celibacy" was often mentioned as their way of life, although they were well aware that the senior members of the staff were all married and most of them financially independent. However, Dr. Cole himself had known poverty in his youth and realized the advantages of celibacy during the beginning of a young man's career.

The five diseases originally selected for investigation in the Hospital were pneumonia, poliomyelitis, syphilis, heart disease, and "intestinal infantilism," now known as celiac disease, which was included for a time because it was being studied by Dr. Christian Herter, a member of the Board of Trustees.

Cole chose as his special problem lobar pneumonia, a disease which at the time was so prevalent and caused such a high mortality that Osler called it "the captain of the men of death." Cole took under his wing a small team of young assistants who made an intensive study of that disease and its causative organism—the pneumococcus. By immunizing horses with type I pneumococci, they produced a serum which was the first effec-

tive treatment for pneumonia caused by that type. Eventually they published an important monograph on pneumonia, *Acute Lobar Pneumonia. Prevention and Serum Treatment* (see bibliography). Incidentally, it should be mentioned as an example of Cole's modesty that the authors were listed alphabetically, not with his name in first place.

One of Cole's great contributions resulted from his appointment as a co-worker of a young Canadian bacteriologist, Oswald T. Avery, who devoted the rest of his career to the study of the pneumococcus. Cole encouraged him and appointed chemists to assist him in his efforts to understand the chemical composition of that microorganism and then to explain the transformation of one type of pneumococcus into another. This work led eventually to the discovery that deoxyribonucleic acid (DNA) was the molecule that altered the heredity of the pneumococcus cell—a finding which initiated the subsequent experimental studies on heredity.

Besides these bacteriological and immunological investigations, many others were pursued in biological chemistry and physiology, each making some contribution to an understanding of one of the diseases being studied at the Hospital. Thus it was that under Cole's direction a vast number of contributions, many of them important, were made to the advancement of clinical medicine and hence to an understanding of disease in man.

During the military mobilization which anticipated the U.S. entry into World War I, Cole interrupted his duties at the Hospital in response to a request by the Surgeon General of the Army that he investigate several outbreaks of pneumonia among troops in army camps. He thereupon made a careful study of such data as were available on the incidence of pneumonia and its mortality, going into the Surgeon General's records as far back as the Civil War. He compared these data with such comparable ones as he could obtain for European armies. It should

be mentioned in passing that at that time pneumonia was not included among the "controllable diseases" listed by the U.S. Public Health Service.

Cole pointed out in his reports that pneumonia was an important cause of death among troops—especially among raw recruits drawn from rural populations and housed of necessity in crowded barracks. He gave consideration to the advisability of vaccination against pneumococcus types I and II, but decided that procedure was impracticable under the circumstances. He stressed the important role of direct contact in the spread of pneumonia, an explanation not widely held at the time.

Cole called attention to the outbreaks of pneumonia which had occurred in Panama during the building of the Canal and also to those among the miners in South Africa. In both instances the highest mortality was suffered among the immigrant workmen, mostly blacks, who had previously escaped exposure to the causative microorganism and were therefore much more susceptible to it than the whites, who had acquired some degree of immunity.

He also pointed out that, although pneumococci were present in the throats of healthy individuals, it was types I and II which were the causative microorganisms in 60 percent of the cases of lobar pneumonia and that they soon disappeared during convalescence. Those types could, however, be cultured from the throats of immediate contacts and from the dust collected from the rooms of patients infected with either of them. These were pioneer observations on the epidemiology of pneumonia.

When Cole was sent by the Surgeon General to Fort Sam Houston, Texas to investigate a serious outbreak of pneumonia there, he was able to report from bacteriological examinations, in which he was assisted by A. R. Dochez and Avery, that, although a few cases of pneumococcal pneumonia were occurring, most of the cases of pneumonia were caused by infection with hemolytic streptococci as a complication of measles.

One of Cole's great contributions to American medicine was the training of the men who worked in his hospital and, like him, became dedicated to the study of disease. At the time he retired from the directorship of the Hospital, a tabulation was made of the positions then held by all the men, American and foreign, who had worked there. It showed that there were at that time 140 with university affiliation, of whom 112 held full-time academic appointments in senior or junior positions, and 28 held part-time positions in academic institutions, including 3 deans and 11 with professorial rank. Among them were 22 who had been elected to the National Academy of Sciences and 46 to the Association of American Physicians, of whom 5 had received the Kober Medal, its highest award.

Such was the record of his accomplishment in the training of men to carry on investigation and instruction in clinical medicine and in the basic disciplines of biochemistry, physiology, and bacteriology in the medical schools of this and several foreign countries. It was a remarkable record of the results of Cole's stewardship as Director of the Hospital of the Rockefeller Institute for Medical Research.

One more of Cole's contributions to the development of clinical medicine in the United States resulted from his conclusion that the University of Chicago was the most appropriate institution in which to establish a medical school where all members of the faculty, including those in the clinical departments, would be on full time, i.e., would hold academic appointments that provided adequate salaries and forbade clinicians to engage in private practice. The University of Chicago already had on its campus strong departments in all the basic sciences which offered preclinical instruction for medical students who then went for their clinical training to Rush Medical College, an affiliated institution on the west side of Chicago.

Cole had for years held the opinion that clinical medicine, i.e., the study of disease in man, was no longer just an art or an applied science, but had become a discipline in its own right,

worthy of recognition by a university as one of the biological sciences and accorded academic status comparable to that of chemistry or history or Latin. This goal was attained at the University of Chicago when hospitals were built on its campus, adjacent to the laboratories of the preclinical sciences, and staffed entirely by clinicians on full time.

After Cole's retirement from the Hospital of the Rockefeller Institute in 1937, he and Mrs. Cole gave up their apartment in New York and moved to Cohomong Wood, their beautiful Mt. Kisco, New York estate, which they owned for many years and had used as a weekend retreat from administrative duties at the Hospital. There they maintained the tradition of gracious hospitality which, through the years, had meant so much to Cole's associates, particularly the younger members of his staff. Although Mrs. Cole's death in 1951 brought great sorrow, Cole remained in the home they had created together, beloved and respected both by children and grandchildren, and by nieces and nephews, in whose accomplishments he took great pride and satisfaction.

Cole did not vegetate. He continued to be active for some years on a number of boards and committees and devoted a good deal of time to improving the nursing care of the sick in various institutions in the vicinity of Mt. Kisco, for such care had long been one of his concerns.

He also rekindled his interest in gardening and published papers on the distinguishing features of English gardens; he continued to paint in watercolors and oils; he wrote poetry, mostly unpublished, which demonstrated his ability to put down his thoughts in beautifully expressed cadences; and he took great pleasure in music.

In addition, he busied himself in things more strictly intellectual. One of his particular interests was the library of the New York Academy of Medicine, to which he gave his valuable collection of the works of Francesco Redi, the seventeenth-

century Italian scientist and poet, many of them in first editions.

His most scholarly undertaking during the period of his retirement was the writing of a history of the social, political, and religious developments of the late sixteenth and entire seventeenth century in England, entitled *Human History: The 17th Century and the Stuart Family* (1959). This was an extraordinary accomplishment for a man of his age and predominantly scientific background, for it shows his ability to make use of source material centuries old. It also exemplifies Cole's ability to relate complicated historical events in easily read, enjoyable English prose.

Cole was able to continue his active intellectual life until his ninety-fourth year. He died on April 20, 1966 in Washington, D.C., where he had gone to receive the Kovalenko Medal, an award bestowed by the National Academy of Sciences on a member for "important contributions to medical sciences." Unfortunately, he was stricken with a rapidly fatal attack of pneumonia, the disease to which he had devoted so many years of study. He had, however, been able to enjoy the knowledge that he had been chosen the recipient of this most distinguished award in recognition of his contributions to the advancement of the study of disease.

TO RUFUS COLE'S three daughters, especially to Mrs. Mary Cole Childs, the author is indebted for much helpful information about their father's life and personal interests.

HONORS AND DISTINCTIONS

DEGREES

University of Michigan, B.S., 1896
The Johns Hopkins University, M.D., 1899
The University of Chicago, D.Sc. (Honorary), 1927
National University of Ireland, D.Sc. (Honorary), 1933

STUDENT HONOR SOCIETIES

Phi Beta Kappa
Nu Sigma Nu
Alpha Omega Alpha

PROFESSIONAL APPOINTMENTS

The Johns Hopkins Hospital
- Resident House Officer, 1899–1900
- Assistant Resident Physician, 1900–1904
- Instructor in Medicine, 1901–1904
- Resident Physician and Associate in Medicine, 1904–1906
- Assistant Physician in charge of the Biological Division of the Clinical Research Laboratory, 1906–1909

Research Student under Professor A. Wassermann, Robert Koch Institut für Infektionskrankheiten, Berlin, 1903–1904

Director of the Hospital of the Rockefeller Institute for Medical Research and Member of the Rockefeller Institute, 1908–1937; Member Emeritus, 1937–1966

Board of Scientific Directors, International Health Division, Rockefeller Foundation, 1929–1936

Chairman, Finance Committee, District Nursing Association of Northern Westchester County, 1930

Board of Managers, St. Luke's Hospital, New York, 1938–1946

Board of Managers, Memorial Hospital, New York, 1938–1944

Advisory Committee, Department of Welfare, Westchester County, 1935

Consultant in Bacteriology, New York State Department of Health, 1936

Consulting Physician, Willard Parker Hospital, 1912–1920

AWARDS

Médaille d'Honneur de l'Assistance Publique de la République Française, 1926
Kober Medal, Association of American Physicians, 1938
Academy Medal, New York Academy of Medicine, 1953
Kovalenko Award, National Academy of Sciences (Posthumously), 1966

MEMBERSHIPS

Danish Society for Internal Medicine, 1920
Medical Society of Sweden, 1920
Copenhagen Medical Society, 1938
Institute of Medicine, Chicago, 1938
American Academy of Arts and Sciences, 1921
American Association for the Advancement of Science, 1912
  Vice President and Chairman of Section N, 1927
American Association of the History of Medicine, 1925
American Association of Pathologists and Bacteriologists, 1915
  Retired member, 1939
American Association of Immunologists, 1917
American College of Physicians, Fellow, 1937
American Medical Association, 1902
American Public Health Association, 1936
American Society for Clinical Investigation, Charter Member, 1908
  President, 1915
American Society for Experimental Pathology, 1913
American Society for Pharmacology and Experimental Therapeutics, 1910
American Society of Tropical Medicine, 1909
Association of American Physicians, 1909
  Vice-President, 1930
  President, 1931
  Kober Medalist, 1938
Charaka Club, 1924
  President, 1939–1940
Harvey Society, 1911
  Lecturer, 1913 and 1930
  Vice-President, 1914–1917

President, 1921–1923
History of Science Society
Councilor, 1937–1940
Interurban Clinical Club
Vice-President, 1911–1912
President, 1921–1923
National Academy of Sciences, 1922
New York Academy of Medicine, 1909
Vice-President, 1920–1922
Academy Medal, 1953
New York Academy of Sciences
New York Clinical Society, 1917
New York Pathological Society, 1910
Practitioners Society, 1916
President, 1940
Society of American Bacteriologists, 1912
Society for Experimental Biology and Medicine
Society of Internal Medicine, 1910
President, 1912–1913

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1902

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Case of malignant endocarditis with septicaemia. Johns Hopkins Hosp. Bull., 13:252.

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Pneumococcus septicemia, meningitis and arthritis. Johns Hopkins Hosp. Bull., 13:143.

1904

Experimental streptococcus arthritis in relation to the etiology of acute articular rheumatism. Journal of Infectious Diseases, 1:714.

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Exhibition of cases of typhoid meningitis. Johns Hopkins Hosp. Bull., 15:62.

Typhoid meningitus. Johns Hopkins Hospital Reports, 12:379.

Exhibition of medical cases. Johns Hopkins Hosp. Bull., 15:258.

1905

Experimental streptococcus arthritis. Johns Hopkins Hosp. Bull., 16:114.

Case of typhoid fever showing some unusual features. Johns Hopkins Hosp. Bull., 16:118.

Pulsating emphysema. Johns Hopkins Hosp. Bull., 16:411.

Cystic kidney. Johns Hopkins Hosp. Bull., 16:411.

1906

Aetiology of acute articular rheumatism. N.Y. Med. J., 83:534.

1907

With J. C. Meakins. The treatment of gonorrhoeal arthritis by vaccines. Johns Hopkins Hosp. Bull., 18:223.

The opsonic theory and the treatment of infections by vaccines. Johns Hopkins Nurses' Alumnae Magazine, 6:57.

Note on the production of an agglutinating serum for blood platelets. Johns Hopkins Hosp. Bull., 18:261.

The vaccine treatment of infectious diseases. International Clinics, ser. 17, 2:1.

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1908

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With A. B. Cecil. The axillary diastolic murmur in aortic insufficiency. Johns Hopkins Hosp. Bull., 19:353.

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1911

Typhoid fever. In: *A Handbook of Practical Treatment,* ed. J. H. Musser and A. O. J. Kelly, 2:176. Philadelphia: Saunders.

1912

Pneumococcus infection and immunity. J. Am. Med. Assoc., 59:693.

Toxic substances produced by pneumococcus. J. Exp. Med., 16:644.

1913

With A. R. Dochez. Report of studies on pneumonia. Trans. Assoc. Am. Physicians, 28:606.

Treatment of pneumonia by means of specific serums. J. Am. Med. Assoc., 61:663.

1914

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Pneumococcus hemotoxin. J. Exp. Med., 20:346.

The production of methemoglobin by pneumococci. J. Exp. Med., 20:363.

1915

Types of pneumococci and their characteristics. Archives of Pediatrics, 32:53; also in Med. Rec., 87:418, under the title: Types of pneumococcus bacilli and their characteristics.

Pneumococcus infection and immunity. (The Packard Lecture.) N.Y. Med. J., 101:1, 59.

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1916

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1917

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1920

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1921

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1925

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1929

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