

IN MEMORIAM

August Krogh

November 15, 1874 – September 13, 1949

AUGUST SCHACK STEENBERG KROGH was born in the small town of Grenaa, on the east coast of Jutland. For generations his father's family had been farmers in South Jutland. However, KROGH's father was trained as a ship builder and settled down in Grenaa. He soon gave up his original trade and started a small brewery. During KROGH's childhood and youth his father worked as a brewer. His parents were fairly well off, and their children were allowed a free choice of education. At about 14 to 15 years old KROGH volunteered into the Danish navy, wanting to become a naval officer. After a cruise in the North Atlantic KROGH gave up his naval career and returned to school. He left high school and entered the University of Copenhagen in 1893. His first idea was to study physics, but after one year at the University he decided to go in for zoology. A friend of his, who was a zoologist himself, gave KROGH the prudent advice to start his zoological studies by attending the lectures in physiology given to medical undergraduates by CHRISTIAN BOHR. Having followed BOHR's lectures for some time, KROGH made up his mind definitely; he wanted to become a physiologist.

In 1899 KROGH left the University as Master of Science and immediately got a post as an assistant in BOHR's laboratory. In 1903 he published his thesis for a doctor's degree: "The cutaneous and pulmonary respiration of the frog". In 1908 he was made lecturer in zoophysiology, a discipline which had not previously been represented at the University of Copenhagen. In 1916 the lectureship was changed into a professorship. From this chair KROGH resigned in 1945.

Between the day when KROGH started his scientific work in BOHR's laboratory and the day of his death lies a most industrious life devoted to science.

A complete list of KROGH's publications comprises about 250 numbers.

In BOHR's laboratory KROGH got into contact with problems within the field of the physiology of respiration. The greater part of KROGH's scientific publications from his younger years falls within this field. In 1910 KROGH published a conspicuous series of papers on the gaseous exchange in the lungs, the last of which concludes: "The absorption of oxygen and the elimination of carbon dioxide in the lung takes place by diffusion and by diffusion alone. There is no trustworthy evidence of any regulation of this process on the part of the organism." The experiments on which this decisive conclusion was founded were carried out by means of the microtonometer introduced by KROGH in 1908. KROGH was an ingenious inventor of apparatus and methods. It is characteristic of KROGH that he was not interested in a method as such. If, however, KROGH encountered a biological problem which could not be solved by means of the tools available, he created the necessary tools himself.

In 1910 KROGH got his own laboratory: The Laboratory of Animal Physiology set up in an old building in Ny Vestergade. As to space the laboratory was extremely modest. In these small rooms, piled with equipment and crowded by collaborators, however, outstanding work has been done.



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In collaboration with J. LINDHARD, KROGH continued his work upon the physiology of respiration (dead space, composition of the alveolar air), and together they published a method for the determination of the cardiac output (1912). In order to make it possible to study circulation, respiration, and general metabolism during muscular work KROGH constructed his famous bicycle ergometer.

In 1918 KROGH's first communication on the function of the capillaries was published in Danish. In the following years a series of papers dealing with various aspects of the physiology of the capillaries appeared. For his work within this field, which has highly contributed to our understanding of the peripheral circulation and the oxygen supply of the tissues, KROGH was awarded the Nobel Prize in 1920. For many years and with various collaborators KROGH continued his studies on the physiology of the capillaries and allied problems, such as colloid osmotic pressure and venous pressure.

KROGH never occupied himself with one subject exclusively for any length of time. A characteristic feature in the list of KROGH's publications is that almost every year papers were published dealing with the most different problems within the entire field of physiology, ranging from human physiology with a bearing on medicine to studies on micro-organisms. In the multitude of subjects dealt with by KROGH, however, some main-subjects can be distinguished. Respiration and circulation with a special view to capillary function have been mentioned. To these may be added: general metabolism. KROGH has constructed a recording apparatus for determinations of the basal metabolism of patients, an

apparatus which is widely used in clinical work. A brilliant piece of work is KROGH's and LINDHARD's investigation on the relative value of fat and carbohydrate as sources of muscular energy, demonstrating an efficiency which is higher on carbohydrate diet than on fat diet. For the gas analysis in these experiments KROGH constructed a gas analysis apparatus accurate to 0.001 per cent. The relation between temperature and metabolism in various animals has been investigated by KROGH. For the purpose of such investigations on chrysalides KROGH constructed his micro-respiration apparatus.

In 1928 KROGH's laboratory was transferred to the new "Institute of Physiology of the University" built from means granted by the Rockefeller Foundation and the International Education Board. The name of the laboratory was changed to: The Laboratory of Zoophysiology. In the more spacious localities of the new institute a greater number of pupils and collaborators benefitted from KROGH's inspiring leadership. The work of the laboratory was continued in the same spirit and on the same variety of fields as hitherto. The physiology of severe muscular exercise was a main-subject in the work of KROGH's laboratory during a number of years following the transfer of the laboratory to the new building. In this work KROGH took an active part. He also brought his vast experience to bear upon problems within applied physiology (tests for pilots, house-heating problems). At the same time he continued his studies on the functions of capillaries and took up new subjects such as the composition of plankton, dissolved substances as food for aquatic organisms, and the organic metabolism of sea-water. KROGH's personal research work became gradually more focussed on zoophysiology proper, that is on investigations on the physiology of animals, not merely as a means of elucidating human physiology but rather as an object of its own. The osmoregulation of aquatic animals became his main-subject. A considerable part of KROGH's papers from his later years may be placed under the heading: the active and passive exchange of inorganic ions through the surface of living cells and living membranes generally.

These studies of general significance were carried out on a great variety of experimental objects and under rather extensive use of the isotope technique.

After having retired from his chair, KROGH continued his scientific work with unabated vigour. In his private house, built shortly before he retired, KROGH had a spacious and well-equipped laboratory fitted up. Here KROGH during his last years was engaged in investigations on a large scale on the physiology of the locust, inaugurated at the instance of the British Government.

KROGH's death will be mourned throughout the scientific world. His life will for ever remain an inspiration for those who earnestly devote their lives to science.

EINAR LUNDSGAARD

Congresses

SWEDEN

XVIII International Physiological Congress

The XVIII International Physiological Congress will be held at Copenhagen the 15th to 18th of August, 1950.

Preliminary program and registration forms will be sent out and will from the 1st of January, 1950, be obtainable from local societies of Physiology, Biochemistry, and Pharmacology, or from the bureau of the congress:

*Zoofysiologisk Laboratorium,
32 Juliane Mariesvej,
Copenhagen Ø.*

NETHERLANDS

IX International Congress of Entomology

The IX International Congress of Entomology will be held at August 17th-24th, 1951, in Amsterdam (Netherlands). Entomologists wishing to receive in due course programs and application forms are requested to communicate already now with the Secretariat, c.o. Physiologisch Laboratorium, 136 Rapenburgerstraat, Amsterdam.

Further communications will follow.

Expédition scientifique en Afrique équatoriale orientale

A partir du 10 janvier la Direction des Laboratoires Biologiques S.A. de Djeddah (Saud-Arabie) organisera de nouveau une expédition scientifique en Afrique équatoriale orientale avec la route suivante:

Diredaua/Hadama/Allata/Gardulla/Debra/Marcos/Gondar

Les guides en chef seront les MM. M. KAMAL, F. J. OYGUR et M. FUAD. Toute personne qui s'y intéresse s'adresse à la Direction des Laboratoires biologiques S.A., Djeddah (Saud-Arabie).

PRAEMIA

Tine Tammes Prizes for 1950 and 1952

The Directors of the Tine Tammes Prizes, Professors Drs. W. A. GODDIJN, R. PRAKKEN, and M. J. SIRKS, announce:—

One Prize for the year 1950 of 500 guilders Dutch currency (about 46 pounds sterling) for a study on the cytogenetics of a group of phanerogamous species;

One Prize for the year 1952 of 500 guilders Dutch currency for a study on genes and their chemical activity.

Conditions:—Manuscripts with illustrations a. o. ready for press, should reach Professor SIRKS before December 1st, 1950, respectively 1952. The Prize paper will be published in the periodical *Genetica* before July 1st, 1951, respectively 1953. Other papers which do not win the prize may be accepted by the editors of *Genetica* for publication in the same number of this periodical. Authors will receive one hundred and fifty reprints free of charge.

Address: Professor Dr. M. J. SIRKS, Genetisch Instituut, Huis de Wolf, Haren (Gron.) Netherlands.