MILISLAV DEMEREC
1895—1966

A Biographical Memoir by
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Biographical Memoir

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IN THE YEAR, 1919, when a certain young Yugoslav agricultural student came to Cornell University to pursue graduate study in genetics under R. A. Emerson, the first great decade of American genetical studies was just drawing to a close. The ensuing four and a half decades, to the time of his death, have been identified with Milislav Demerec's own career and contributions as with few others. He was among the dozen or so geneticists whose work has made the United States preeminent in this biological science. His own contributions reflected not only great profundity in seizing upon the most important problems for investigation but also great flexibility in shifting from one area of significance to another, at the cost of abandoning tried techniques and acquiring skill in entirely new ones. Yet equally important to the advancement of science, along with his investigations and discoveries, were his gifts of scientific leadership and administration. No account of his life must ignore their value.

Milislav Demerec was born in Kostajnica, Yugoslavia, on January 11, 1895. He graduated from the College of Agriculture, Krizevci, Yugoslavia, in 1916 and held a position as Adjunct at the Krizevci Experiment Station until 1919, when he came to the United States to study at Cornell University. He received the Ph.D. degree in genetics from Cornell in 1923,
having worked as assistant in plant breeding during several years of his graduate study. In 1923 he joined the staff of the Department of Genetics, Carnegie Institution of Washington, in Cold Spring Harbor, New York, as a Resident Investigator. He was appointed Assistant Director in 1936, Acting Director in 1942, and Director in 1943. From 1941 he was also Director of the neighboring Biological Laboratory of the Long Island Biological Association, which was later renamed the Cold Spring Harbor Laboratory of Quantitative Biology.

On June 30, 1960, Dr. Demerec retired from the directorship of the Department of Genetics of the Carnegie Institution of Washington, and joined the research staff of the Brookhaven National Laboratory as a Senior Staff Member. There he continued his program of research in bacterial genetics until the end of 1965. He then became Research Professor of Biology at C. W. Post College of Long Island University, and remained very active in research until his sudden death from a heart attack on April 12, 1966. A number of posthumous papers, completed by his colleagues, represent work actively in progress at the time.

He has twice been honored since his death, first by C. W. Post College, which named its science building the Milislav Demerec Science Laboratory; and most recently by the Cold Spring Harbor Laboratory of Quantitative Biology and the Carnegie Institution of Washington, which on June 5, 1968, jointly named in his honor the principal laboratory building constructed by the Carnegie Institution of Washington on the land of the Cold Spring Harbor Laboratory (held by the Wawepex Society).

Dr. Demerec held appointments as Research Associate of Columbia University (1943-1965), Consultant of the Brookhaven National Laboratory (since 1948), Visiting Professor at the Rockefeller Institute of Medical Research (1958-1960), and Consultant in Genetics and Cellular Biology at Adelphi
Besides giving lectures and seminars in many parts of the United States, Europe, Asia, Africa, and South America, he was instrumental in bringing numerous young foreign scientists and students to the United States to receive experience and instruction in methods of research developed here.

Dr. Demerec was a member of the Council of the 6th International Congress of Genetics, held in Ithaca in 1932; vice president of the 7th Congress, held in Edinburgh in 1939; member of the Permanent International Committee of the International Genetics Congress, 1939-1953; chairman of the Committee on Transportation for the 8th Congress, held in Stockholm in 1948; and a member of both the Organizing Committee and the Program Committee for the 10th Congress, held in Montreal in 1958. He served as secretary-treasurer (1935-1938), vice president (1938), and president (1939) of the Genetics Society of America; as treasurer (1933-1935), vice president (1947), and president (1954) of the American Society of Naturalists; as chairman of the U.S.A. National Committee of the International Union of Biological Sciences; and as member or chairman of many committees appointed by the National Academy of Sciences to study special problems of national and scientific importance. In particular, he served on the Committee on the Genetic Effects of Atomic Radiation, which made important reports in 1956 and 1960. He was chairman of the Section of Zoology and Anatomy of the Academy from 1958 to 1961.

Dr. Demerec was a member of the National Academy of Sciences (elected in 1946) and of the American Philosophical Society (elected in 1952). He was a fellow of the American Academy of Arts and Sciences, the New York Academy of Sciences, and the American Association for the Advancement of Science; a member of the council of the Radiation Research Society; and a member of many other professional organizations, including Sigma Xi, Phi Kappa Phi, the Society of American
Bacteriologists, the Society for the Study of Evolution, the American Genetic Association, the American Society of Zoologists, and the Botanical Society of America. He was honored for his scientific accomplishments by being awarded the Order of St. Sava by the Yugoslav government in 1935, and by honorary memberships in the Royal Danish Academy of Sciences and Letters, the British Genetical Society, the Academy of Sciences of Yugoslavia, the Genetics Society of Japan, the Society of Biology of Santiago, Chile, and the Faculty of Medicine of the University of Chile. In 1957 he received from Hofstra College the honorary degree of Doctor of Laws; in 1960 the degree of Doctor honoris causa from the University of Zagreb; and in 1961 the degree of Doctor of Science from Long Island University.

Dr. Demerec became a naturalized citizen of the United States in 1931. In 1921 he married Mary Alexander Ziegler, engineering graduate of Cornell University and teacher of science. Dr. and Mrs. Demerec had two daughters who have survived him, Mrs. Philip E. Hartman and Mrs. Neville Dyson-Hudson, both of Baltimore, Maryland; and five grandchildren.

Dr. Demerec's research spanned a period of forty-six years, and was directed toward a better understanding of the nature of genes, their structure and function, and their spontaneous and induced mutability. Demerec began his genetic investigations with a study of the basis of variable phenotypic traits. The striping of leaves, the variegations of maize seeds, and the virescence of seedlings that at first are albino but later turn green evoked in him a deep interest in the basis of somatic mosaicism. Suspecting somatic mutation to be a prevalent cause of such changes, he very early directed attention to this phenomenon, and shifted from maize to Drosophila virilis and to delphiniums as appropriate organisms for probing the nature of the factors that control mutation rates. His classic pa-
pers on the unstable genes of *Drosophila virilis* remain basic to an understanding of the mutation process. These genes exhibited different mutation rates at different stages of the life cycle and in different tissues.

A second period in Demerec’s genetic investigations began in the early 1930s with the study of X-ray-induced mutations and deficiencies in *Drosophila*. Here, too, an interest in the role of gene mutation in ontogeny was evident, since one of his most important early contributions to this new area was the relation of induced deficiencies to cell lethality. With the introduction of salivary gland chromosome analysis, the work on deficiencies and other types of chromosome aberrations advanced rapidly, in collaboration first with Margaret Hoover, and later with B. P. Kaufmann, Eileen Sutton, and others. Demerec’s interest in the factors controlling spontaneous mutability was not lost, however. From this period date also those extremely significant studies of the differences in mutability in various wild-type strains of *Drosophila melanogaster*, and the identification of a mutability-stimulating gene in the Florida stock.

By the 1940s Demerec was studying the effects of ultraviolet radiation and of neutrons in inducing gene mutations and chromosome aberrations, but the advent of World War II, with certain practical demands, brought about a shift of activity in his laboratory at Cold Spring Harbor. Of enormous practical importance was the work performed to induce, in Penicillium, mutations that greatly increased the yield of penicillin. Of greater long-range value were the parallel studies of mutations evoking resistance on the part of Staphylococcus to penicillin and other antibiotic agents or to drugs. A major new direction of genetics was initiated by Demerec and Ugo Fano in their 1945 paper on bacteriophage-resistant mutants in *Escherichia coli*. By the end of the 1940s *Drosophila* studies had been fully replaced by studies of radiations and chemical mu-
tagens (including carcinogens) and their effects on the genes of bacteria, especially in relation to mutations promoting bacterial resistance. The latter research revealed two important principles to be followed in antibiotics therapy. These drugs should be administered in high enough initial doses to prevent the occurrence of “second-step” (highly) resistant bacterial mutants; and they should be used in combination rather than singly, since a mutant that is resistant to one antibiotic has a very small chance of being resistant to another one also. This work in turn led, in the 1950s, to the studies that were to occupy Demerec until the end, namely, the investigation of recombination and the fine structure of the gene in Salmonella, the agent causing mouse typhoid.

By special techniques of transduction and hybridization, Demerec analyzed various genes that control the synthesis of amino acids and purines in Salmonella. Independently, and in collaboration with Philip Hartman and others, Demerec analyzed the functional organization of the bacterial chromosome and discovered a remarkable parallelism between the sequence of functional units and the sequence of biochemical steps in a chainlike synthesis. It became evident that the gene is a complex structure, rather than the basic unit of heredity as was formerly supposed. Smaller units, or mutational sites, can be distinguished within it, and their relative positions determined. It appears that these sites, too, tend to be grouped together according to similarity of function.

Aside from his earliest scientific studies while a graduate student, and his years following retirement, which were spent at the Brookhaven National Laboratory and at C. W. Post College, all of Demerec’s long career was identified with Cold Spring Harbor, from that first day in 1923 when he arrived as a fresh Ph.D. to join the staff of the Department of Genetics of the Carnegie Institution of Washington, to the day in 1960 when he retired as Director of both the Carnegie Institution's
Department of Genetics and the Long Island Biological Laboratory. In that span of nearly forty years of activity, Demerec had made Cold Spring Harbor a worldwide focus of inspiration and leadership in genetics. This role began when he became Director of the Biological Laboratory in 1941, and in the following year Acting Director of the Carnegie Institution's Department of Genetics. In 1943 he became the Director of the Carnegie Department, and the close and fruitful collaboration of the two neighboring biological institutions started them toward the fusion that eventually took place. The outstanding series of Cold Spring Harbor Symposia in Quantitative Biology which he organized from 1941 to 1960 brought scientists from all over the world to engage in relaxed, informal conversations on the sandspit and the veranda of Blackford Hall, as well as in the formal sessions where interesting and sometimes epochal papers were presented and discussed. From 1941, when the symposium on "Genes and Chromosomes" was held, until the year of his retirement, it was chiefly the foresight and wisdom of Milislav Demerec in choosing subjects of most timely interest, selecting participants of worldwide eminence, organizing the program, and editing the proceedings that made Cold Spring Harbor in June the mecca of genetic biology, where genetics, evolution, and biochemistry came together in fruitful interaction.*

Stimulating contacts spread through the summer as visiting research workers exchanged ideas with each other and with members of the permanent staffs of the Biological Laboratory and the Carnegie Department. At least one visitor can testify that he never worked harder than during those summers and never had a better vacation for himself and his family than in those years when Cold Spring Harbor was a summer

*It is characteristic of Demerec's innate modesty that he did not list these volumes in his bibliography, but in simple justice this has been done by the author of the present memoir.
home and laboratory. By judicious appointments to the re-
search staffs of the two institutions, Demerec kept the spear-
heads of investigation probing into significant new fields. Es-
pecially noteworthy was the arrival of A. D. Hershey in 1950.
Cold Spring Harbor had already become at that date a center
of the phage group. Summer meetings had led in 1945 to the
establishment of a special summer course for instruction in the
theory and techniques of genetic investigation with bacterial
viruses. A parallel summer course in the genetics of bacteria
was started in 1955. These and later additions to the summer
courses have added undying importance to Cold Spring Har-
bor as a biological center, for here germinated much of the
work that flowered in the present effulgence of microbial and
viral genetics throughout the world.

Somehow, year after year, Demerec made this possible on a
financial shoestring. The Carnegie Institution provided not
only new laboratories for its own staff but also a grant to the
Biological Laboratory for the construction of a handsome
auditorium suitable for future Cold Spring Harbor symposia
and other summer meetings. Grants were obtained to support
the permanent staff of the Biological Laboratory and the sum-
mer courses, and to maintain the charming but ancient build-
ings. Year after year local friends of the Cold Spring Harbor
community were encouraged to help maintain the Labora-
tory through their gifts. The scientific community through-
out the United States was canvassed. In mysterious ways, and
with real courage, for two decades Demerec found the means
not only to keep the summer programs and the year-round
research going, but to expand them in significant directions of
the new molecular biology that was springing into being.

Demerec served the scientific community in many ways. In
addition to the large number of scientific organizations, con-
gresses, and committees he aided, his editorial activities were
very great. He was responsible for the publication of the Cold
Spring Harbor Symposia on Quantitative Biology. In 1934 he started Drosophila Information Service. This was the first of the professional newsletters and information services in genetics. He established the Drosophila stock center at Cold Spring Harbor in the Carnegie Department of Genetics, the first of such stock centers to maintain the important experimental stocks of Drosophila and to supply them to Drosophila workers around the world. He edited a basic handbook for Drosophila, The Biology of Drosophila. Together with B. P. Kaufmann, he wrote the Drosophila Guide, a handbook of enormous usefulness to all geneticists and other workers with that exemplary organism. The booklet has gone through seven editions. Demerec founded the series Advances in Genetics (Academic Press) and served as editor for nine volumes, from 1947 through 1958; he also served on the editorial boards of several genetical journals. Yet in the end those of us who knew him well will remember him as the characteristic spirit and impulse of Cold Spring Harbor, a nerve center of modern genetics.
1921

1922

1923
Inheritance of white seedlings in maize. Genetics, 8:561-93.
Heritable characters of maize. XV. Germless seeds. J. Heredity, 14:297-300.

1924
Genetics of four groups of seedling characters which affect the development of chlorophyll in maize. Anat. Record, 29:133-34. (A)
Genetic relations of five factor pairs for virescent seedlings in maize. Cornell University Agricultural Experiment Station Memoirs, 84:1-38.
1925

Reddish—a frequently "mutating" character in *Drosophila virilis*. Anat. Record, 31:345. (A)


Inheritance of pale green seedlings in maize. Genetics, 10:318-44.

1926


Heritable characters of maize. XXV. Piebald seedlings. J. Heredity, 17:300-6.


1927


A second case of maternal inheritance of chlorophyll in maize. Botanical Gazette, 84:139-55.

1928


The behavior of mutable genes. Verhandlungen V Internatio-
naler Kongres für Vererbungswissenschaft, Berlin, pp. 183-93.


1929


1930
A genetic factor affecting germinal mutability of miniature-alpha wing character of *Drosophila virilis*. In: The Laws of Life, Memorial volume of the 60th birthday of Professor V. Ruzicka, pp. 45-56. Prague, Aventinum.

1931
The gene. (Résumé of a lecture.) The Biological Laboratory, 3:29-32.

1932
1933


What is a gene? J. Heredity, 24:368-78.


1934


1935


Relative importance of various genes to the organism. Science, 81:420. (A)


1936

With Margaret E. Hoover. Deficiencies in the forked region of the X-chromosome of *Drosophila melanogaster*. Am. Naturalist, 70:47. (A)


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With Margaret E. Hoover.  The gene.  Carnegie Inst. Wash. Year
Book, 35:40-45.

1937

A mutability stimulating factor in the Florida stock of Drosophila
melanogaster.  Genetics, 22:190. (A)
Differences in mutability in various wild-type lines of Drosophila
melanogaster.  Science, 85:442. (A)
With Hugo Fricke.  The influence of wave-length on genetic ef-
Relationship between various chromosomal changes in Drosophila
Frequency of spontaneous mutations in certain stocks of Dro-
 sophila melanogaster.  Genetics, 22:469-78.
With B. P. Kaufmann.  Frequency of induced breaks in chromo-
23:484-88.
With Helen Slizynska.  Mottled white 258-18 of Drosophila mel-
Book, 36:44-51.

1938

With Hans Bauer and B. P. Kaufmann.  X-ray induced chromo-
somal alterations in Drosophila melanogaster.  Genetics,
23:610-30.
With B. P. Kaufmann and Margaret E. Hoover.  The gene.  Car-

1939

With Margaret E. Hoover.  Hairy-wing duplication in Drosophila
melanogaster.  Genetics, 24:68. (A)
L'importanza di alcuni loci per l'organismo.  Scientia Genetica,
1:123-28. (Turin)
With Margaret E. Hoover.  Hairy wing—a duplication in Dro-
The nature of x-ray-induced lethal changes in the Notch region of the X-chromosome of *Drosophila melanogaster*. Science, 89:401. (A)


1940


A comparison between the x-ray induced and the spontaneous Notches. Genetics, 25:115-16. (A)


1941

With U. Fano. Measurements of the frequency of dominant lethals induced in sperm of *Drosophila melanogaster* by x-rays. Genetics, 26:151. (A)


1942

With Alexander Hollaender, M. B. Houlahan, and M. Bishop. Effect of monochromatic ultraviolet radiation on *Drosophila melanogaster*. Genetics, 27:139-40. (A)

With B. P. Kaufmann and Eileen Sutton. Genetic effects produced by neutrons in *Drosophila melanogaster*. Genetics, 27:140. (A)

With B. P. Kaufmann. Sperm utilization in *Drosophila melanogaster* following single and multiple inseminations. Genetics, 27:150. (A)


Editor. *The Relation of Hormones to Development*. Cold
1943

With S. Zamenhof. Heavy water and mutations. Genetics, 28:96. (A)


1944


1945


1946

1947
Resistance to drugs. Ideas for Teachers (Nassau County Tuberculosis and Public Health Association), 13:2.
Production of mutations in Drosophila by treatment with some carcinogens. Science, 105:634. (A)

1948


Mutations induced by carcinogens. British Journal of Cancer, 2:114-17.


1949


1950


Reaction of populations of unicellular organisms to extreme changes in environment. Am. Naturalist, 84:5-16.


With Vernon Bryson. Patterns of resistance to antimicrobial
With E. M. Witkin, B. W. Catlin, J. Flint, W. L. Belser, C. Dissos-
Editor. Advances in Genetics, Vol. 3. New York, Academic Press,
Inc. 267 pp.
Editor. Biology of Drosophila. New York, John Wiley & Sons,
Inc. x + 632 pp.
Editor, with Katherine B. Warren. Origin and Evolution of Man.
Foreword, v-vi.

1951
With G. Bertani and J. Flint. A survey of chemicals for muta-

Studies of the streptomycin-resistance system of mutations in E.
coli. Genetics, 36:585-97.
Biochemical aspects of genetics (review). Biochemical Society
Symposium No. 4, organized and edited by R. T. Williams.
Archives of Biochemistry and Biophysics, 33:491-92.
With Jessie Hanson. Mutagenic action of manganous chloride.
Editor, with Katherine B. Warren. Genes and Mutations. Cold
Foreword, v.
With E. M. Witkin, E. J. Beckhorn, N. Visconti, J. Flint, E. Cahn,
R. C. Coon, E. J. Dollinger, B. Powell, and M. Schwartz. Bacte-
Department of Genetics. Carnegie Inst. Wash. Year Book, 50:167-
74.
Editor. Advances in Genetics, Vol. 4. New York, Academic Press,
Inc. 343 pp.

1952
Department of Genetics. Carnegie Inst. Wash. Year Book, 51:183-
90.
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1953


Reaction of genes of *Escherichia coli* to certain mutagens. Symposia of the Society for Experimental Biology, 7:43-54.


1954


1955


Dva predavanja o genetici mikroorganizma. (Lecture given at the Yugoslav Academy of Sciences, Zagreb.) Predavanja Odrzana u Jugoslavenskoj Akademiji Znanosti i Umjetnosti, 15:5-38.


1956


With Z. E. Demerec. Analysis of linkage relationships in Salmonella by transduction techniques. Brookhaven Symposia in Biology, 8:75-84.


With Zlata Hartman. Tryptophan mutants in Salmonella typhi-


1957


1958


1959


Albert Francis Blakeslee. Genetics, 44:1-4.


1960


1961


1962


1963


1964


1965
With K. E. Sanderson. The linkage map of Salmonella typhimurium. Genetics, 51:897-913.

1966

1967

1968
With Ikuo Ino. Enteric hybrids. II. S. typhimurium–E. coli hybrids for the trp-cysB-pyrF region. Genetics, 59:167-76.

**BIOGRAPHICAL NOTICES**

