molecules. It is sometimes suggested that one such gene, whether unimolecular or multimolecular, is lodged in each of the chromomeres which at certain stages are visible in the chromosomes. Naturally, though not necessarily, going with these ideas, is the conception that the genes are primary as compared with the chromosome; that the chromosome is a secondary aggregation of genes, which conceivably might be separate.

Another conception of the matter has been presented and has come into some prominence of late. It is a conception which would change in some fundamental respects the interpretation of the phenomena that I have described, though the phenomena themselves would of course remain. According to this conception, the chromosomes are the primary and unitary structures, while the genes are but differentiations in the length of the filamentous chromosomes. This idea has recently been ably worked out, from the standpoint of physical and organic chemistry, by Dr. Dorothy M. Wrinch.[2] According to this view, the chromosome is to be conceived as a structure constituted of two types of elements making a sort of warp and woof. The warp is a set of longitudinal filaments or bundles composed of "identical sequences of protein molecules in parallel"; the woof of a set of ring-like nucleic acid molecules surrounding the protein filaments and holding them together. The longitudinal protein bundles are held to consist of "polypeptide molecules placed end to end with suitable linkages." These molecules thus placed end to end are not identical, but are held to differ in a definite pattern, so as to form a linked chain of diverse molecules, indicated by Wrinch in the following formula:

$$A_1\ B_1\ C_1 \ldots X_1\ Y_1\ Z_1,\ A_2\ B_2\ C_2 \ldots$$
$$X_2\ Y_2\ Z_2,\ A_n\ B_n\ C_n \ldots X_n\ Y_n\ Z_n$$

These molecular diversities constitute the basis for the differentiations that give rise to the conception of genes. The nucleic acid rings form transverse darkly staining bands, distributed at irregular intervals along the length of the chromosome, their location and extent depending on whether the reaction of the protein molecules beneath them is prevailingly acid or basic.

Recently certain huge chromosomes—the salivary chromosomes of insects—have been minutely investigated. These show a banded structure such as agrees with the conception of Wrinch; and it has been proved that these bands have definite and constant relations to known genes. So far as they go they perhaps support the conception of the chromosome that I have just described.

According to this view of the matter, then, it is the chromosomes that are primary, the genes being but differentiated regions in them, which may be broken apart and recombined with the corresponding part of similar block taken from it at any other level. Any such block might be called a gene. This conception, if it finally prevails, will considerably alter the picture of the genes and their relations, and may serve as a guide to fruitful study of their properties and mode of operation. It would possibly incline us to answer in the negative the question whether biology has discovered fundamental units comparable to those of physics. But it will not materially alter the general picture of the relation of genes to development and heredity, as I have just tried to present it. Whether the genes are essentially separate units or only differentiations in the body of the chromosomes, they are structures which, when in appropriate combinations, give rise to living, conscious organisms; and which, by the changes that occur in them, give origin to the infinite variety of the organic world, and to the changes that we call organic evolution.

OBITUARY

WILLIAM BUCHANAN WHERRY[1]

1875–1936

BORN of missionaries in India, in 1875, raised in our Middle West, wanderer into the Philippines, Japan and Hawaii and dead in Cincinnati in the night of November first, 1936—such is the material sequence in the life of William Buchanan Wherry. Accompanying it, like a shadow, is the story of a soul.

The spirit spoke Hindoostani before it could lisp English—and never forgot that tongue. And forever after was it thus to speak more of the mystery of life and less of life's obviousnesses.

At fourteen he was catapulted into the rough surroundings of Chicago's offside; at seventeen made a student of the classics in conformist Pennsylvania, to learn there, non-conformity.

Then back—because more convenient—to the Middle West, where he was to walk with gods, sunk like himself in the mire of man's life on Halsted Street—Ludvig Hektoen, Frank Billings, Edwin Oakes Jordan. Whereafter he lived for a season with Theobald Smith. Now blessed with the hallowed oil of their approval, he entered the fight on his own, out where the frontiersman struggles 'gainst miasma, 'gainst pestilence and

[2] Dorothy M. Wrinch, *Protoplasma*, 25: pp. 550–569, 1936.

[1] Tribute read into the service at the funeral on the morning of November third in the auditorium of the Medical School of the University of Cincinnati.

creeping death. Thus for three years did he labor in Manila where fever ran high, where suffering was great and men spat blood, black.

Veteran, he returned to America, sans fat, sans medals, sans the frogs even on a military officer's coat, to apologize that so lowly of the Lord could not set fish before his friends.

Without a job, then with a job, with money, even, he bought a diamond as tribute to the girl who for thirty years was to bring him peace, comfort and the quiet of restful background. That was home.

But his life and work lay—as they had always—outside. And so forward once more to lovely California to risk death 'midst rats, 'midst fleas and bubosed men. The end? The finding that on the West Coast plague stalks in the ochred hills and in the pretty yellow skins of ground squirrels.

In 1909 medical Cincinnati felt the need of repair. Its spirit was drooping and blood was needed. Who better than this youngster of many countries and many views? And for twenty-seven years he furnished just this.

Here he labored, and delightedly. So it was that he made large contribution to that play which had always intrigued him—the battle of all living things against environment and the battle of each against the other. Here he became world master in a field, and of those few who see not fact but philosophy.

In 1913 he recognized an eye infection in a patient as identical with a disease of California's ground squirrels; and tularemia in man was born. Unknown, it had long been the nemesis of the rabbit hunter and the butcher, to whom, after infection, life was a despairing gamble. But it was less so, by much, when Wherry finished with a serum.

The development of a resistance-bearing serum in this instance was, however, but one of a set of them. When yet a medical student he had pushed forward the vaccine studies of Pasteur and Wright and, in the free moments since, he had applied himself further to this task. Thus, by better winging of the offenders, did he lift the odds in staphylococcus, streptococcus and typhoid infection.

In the 20's of this century the urge of the Orient came again upon him. Had he not written out of that dream state which appeared always to be his, in 1913: "Encircling the earth, between 30° N. and 30° S. are tropical and subtropical regions—the most beautiful, the most fertile, the most richly endowed portions of the globe. Time and again they have been invaded. . . . Stricken by strange pestilences, the invaders have disappeared . . . there lies 'the white man's grave.'"

And better to cheat it, for a season, he went where East touches West; then year after year, into Mexico, Hawaii, the Philippines or Japan to study their amœbae, their worms, their sprue, their leprosy. All life was his field and all life fell under the scrutiny of his piercing sight, to reveal itself, times without number, as to the confessor. Thus he learned how to grow the leprosy out of rats and later out of man.

Amid these labors and in the circle of those he loved best, his eyes closed to the everlasting sleep. So today he is no longer one of us, but one of the glorious company of God's chosen.

Because of his being, men know more and think differently. The voluntary adherent of no orthodoxy, life made him slave to her greatest—the truth itself. This he used to whisper to students sitting close, to colleagues, to those who were the intimates among the friends whose number was legion. Out of his smile the despairing drew hope; out of his mind, healing; from his somewhat frail body his associates tapped strength.

And so of this figure who in life walked so frequently before us into the darkness, we can but say that in death he has preceded us again. We do not cry: Farewell! We lift our arms to call: Hail!

MARTIN H. FISCHER

RECENT DEATHS AND MEMORIALS

DR. WILLIAMS MCKIM MARRIOTT, dean of the University of California Medical School, died on November 11 at the age of fifty-one years. He had been ill since receiving the appointment last August. Dr. Marriott was appointed professor of pediatrics at Washington University, St. Louis, in 1917. For thirteen years before going to California he was dean of the Washington University School of Medicine in St. Louis, having previously taught at the University of North Carolina, at Cornell University and at the Johns Hopkins University.

DR. AUGUSTUS HERMAN GILL, professor emeritus of chemistry at the Massachusetts Institute of Technology, a member of the Massachusetts State Board of Health, died on November 11 at the age of seventy-two years.

FRANK A. LAWS, professor of electrical measurements at the Massachusetts Institute of Technology until his retirement as professor emeritus in 1932, died on November 12 at the age of sixty-nine years.

DR. THEODORE BRENTANO WAGNER, chemical engineer of New York City, died on November 12 at the age of sixty-seven years.

DR. JOSEPH G. MAYO, son of Dr. Charles H. Mayo, of the Mayo Foundation, Rochester, Minn., was killed in an automobile accident on November 9. Dr. Mayo entered the Mayo Foundation as a fellow in July, 1928, and was made an associate in medicine in the Mayo Clinic in July, 1934.