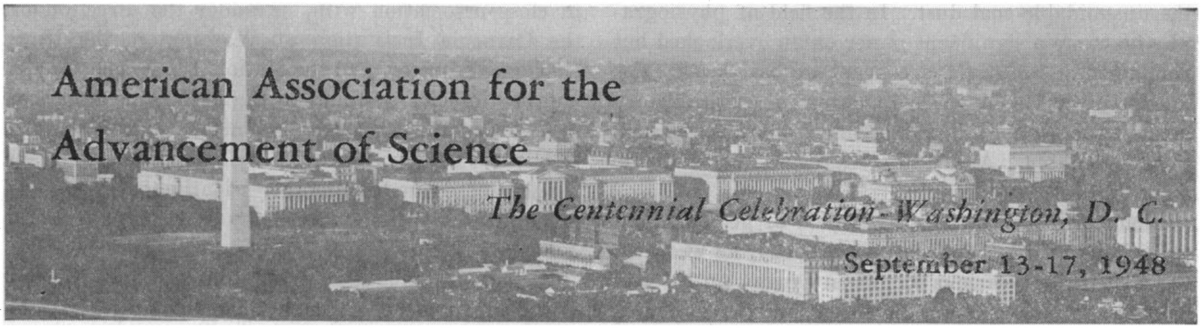

The U. S. Naval Observatory

The U. S. Naval Observatory, founded in 1842, sets the Nation's clocks and derives and publishes astronomical information in the public interest. Continual observations of the positions and motions of the sun, moon, planets, principal stars, and other objects are maintained, making possible the advance predictions published annually in the American Ephemeris and the Nautical and Air Almanacs. These volumes are used by all marine and air navigators and by surveyors, astronomers, and other scientists.

The Observatory pioneered in the development of the photographic zenith tube for accurate time determination. This instrument, now being adopted by other principal nations, contributes to the present high accuracy of frequency standards used in radio communication and other applications of electronic techniques. Here, also, the transit circle and its auxiliary apparatus, used for fundamental determinations of celestial positions, have been developed to their present degree of accuracy and efficiency.

By international agreement the tables derived at the Observatory for calculating the positions of the sun and planets have been adopted for official use all over the world, as have also certain star catalogues and fundamental constants of astronomy. The Observatory has, in addition, made notable contributions to celestial mechanics and mathematical astronomy.

Now under way is a large-scale investigation in cooperation with the Yale University Observatory and the Watson Scientific Computing Laboratory, sponsored by the Office of Naval Research, and intended to place on a firmer mathematical and observational basis the theories of motions in the solar system. Also in progress is a topographical survey of the moon's marginal zone, which will greatly increase the usefulness of this body for long-distance triangulation on the earth, for determining the variability in the earth's rate of rotation, and for several astronomical purposes.

The Observatory is organized in 5 astronomical divisions, each under the supervision of an astronomer, administered by the Department of the Navy through the superintendent, Capt. Guy W. Clark, USN. The two Divisions of Meridian Astronomy, under C. B. Watts and F. P. Scott, determine fundamental positions of the sun, moon, planets, and stars. The Time Service, under Paul Sollenberger, determines accurate time and, with the same instrument, the variation of latitude. The Division of Equatorial Instruments, in charge of H. E. Burton, observes satellites, minor planets, and other objects too faint or otherwise unsuitable for the meridian instruments. The satellites of Mars were discovered in 1877 with the 26″ telescope. The Nautical Almanac Office under G. M. Clemence, utilizes the results of the observations and calculates and publishes the three annual publications of the Observatory; the assistant director is E. W. Woolard.

For the second time in its history the Observatory is preparing to move to a location more suitable for astronomical work. The original site, north of the Lincoln Memorial, was vacated in 1893. The present location, at Massachusetts Avenue and 34th Street, N.W., was then satisfactory but has since deteriorated astronomically due to the growth of the city.

Symposium on Genes and Cytoplasm

One of the symposia planned for the Centennial Celebration is to deal with Genes and Cytoplasm. The fundamental importance of the gene in all kinds of creatures from microorganisms to man is widely recognized, but *how* genes accomplish their great effects, control of the biochemical, physiological, structural and behavioral properties of the organism, has only within the last decade been subjected to concentrated exploration on a scale and in a manner that may lead to a general solution. This broad question involves two distinct problems that have been attacked by different experimental methods. On the one hand is the problem of the nature of the primary activity of genes, their first and possibly their only direct activity. On the other hand is the problem of how these basic gene activities can result in the development of an organism with its cells and tissues alike in genes but different in hormone and enzyme production, in structure, and in behavior. The problem of abnormalities in development, such as cancer, is, at least in part, a special case of the more general problem of developmental differentiation. Not only are the diversities among cells of one body cytoplasmic, but the products of gene activity operate *in* the cytoplasm, and there appear to be, moreover, cytoplasmic materials (plasmagenes) comparable to nuclear genes. The cytoplasm must therefore be investigated along with the genes in attempts to discover what genes do and how cells with the same genes become diverse. These two major problems are dealt with from biochemical, genetic, and embryological points of view by the three papers to be presented in this Symposium.

One of the most fruitful trends in modern work has been the shift of attention from morphological traits, which are remote from the primary action of genes, to biochemical properties of the organism, which must underlie the morphological traits and be more directly related to primary gene activity. Among biochemical traits, two classes have held out the greatest promise of being close to primary gene activity: enzymes and antigens. Indeed, it has even been suggested that the primary products of gene activity may be enzymes, antigens, or their specific reactive molecular groupings. In this field, no modern investigation has been more successful or attracted more attention than the biochemical genetics of the bread mold, *Neurospora,* a program initiated by the geneticist Beadle in collaboration with a group of biochemists led by Tatum. One of the initial members of this group, the biochemist, David Bonner, of Yale University, will present a paper on the status of genic control of biochemical reactions and the possibility of arriving, by such studies, at a knowledge of the gene and its primary activity.

Whatever conclusions are reached as to the primary action of a gene, they will have to be reconciled with many facts discovered by the methods of genetics. Among these are the facts on which are based the concepts of position effect, interaction of alleles, and genic balance. The activity of a gene may be modified either in dependence upon its position in the chromosome, or by the kind of allele present in the same nucleus, or by the ratio between the number of genes of one kind and the number of genes of other kinds present in the nucleus. These phenomena, puzzling in themselves quite aside from the difficulty of reconciling them with the rapidly growing knowledge of biochemical genetics, form the subject of a paper to be presented by Curt Stern of the University of California, Berkeley. Prof. Stern, who is a member of the National Academy of Sciences and has had a distinguished career as a geneticist since obtaining his doctorate at Berlin in 1923, has discovered new facts in these fields and interpreted them by theoretical concepts to account for these difficult matters. These concepts, moreover, lend themselves readily to a reconciliation between them and the new biochemical genetics.

The biochemical approach represented by Bonner and the genetic approach of Stern go far towards providing us with insight into the primary activity of genes. There remains, however, the essentially embryological problem of accounting for the origin of differences among cells with the same genes. Here a decisive role of cytoplasmic factors has long been suspected. In agreement with this, German plant geneticists have for over 20 years been accumulating evidence for the existence in the cytoplasm of gene-like determiners. Similar agents have more recently been discovered in a few animals by French, American, and English workers. Curiously enough, though the problem is essentially an embryological one, the main clues to its solution have come from studies on unicellular organisms, in which all the cells produced by one ancestor are usually alike in traits as well as in genes (yeast, bacteria and the protozoan *Paramecium*). It is no accident that the traits investigated in these organisms are mainly enzymes and antigens, the two classes of substances held to be most closely related to gene activity. An account of this work will be presented by T. M. Sonneborn, of Indiana University, also a member of the National Academy of Sciences and the leader of a group that shared the 1946 prize of the American Association for the Advancement of Science for their studies on *Paramecium.* The work to be reviewed by Prof. Sonneborn leads to the view that the products of gene activity, such as antigens, are themselves endowed with the genic property of self-duplication and that competition among these plasmagenes gives rise to persistently diverse cell types.

With this full turn of the wheel, there emerges the beginning of a synthesis. Each gene performs a definite biochemical activity, probably conferring specificity upon the more complex materials of the cell, such as enzymes (Bonner); in this activity, the genes vary in their affinity for the substrates on which they operate, and they vary in their efficiency in operating upon them (Stern); the enzymes and antigens specified by gene activity may themselves be gene-like (plasmagenes), and the diversities arising among cells with the same genes may be due to the different results of competition among them under different conditions (Sonneborn). This symposium attests to the attainment, by biochemistry, genetics and embryology, of common ground from which springs a tentative general view of the nature of gene action in heredity and development.