ode rays corresponding to these same enormous voltages. In the medical field these cathode rays may have a good deal of therapeutic interest in the treatment of deep-seated tumors, since they will have sufficient penetration and since, unlike x-rays and gamma rays, their effect will be a maximum near the end of their range—properties which should facilitate the destruction of a tumor without damage to the overlying tissues.

The fluoroscopic application of x-rays is also being developed rapidly for use in industry, where it makes possible the ready examination of small metal castings. Without this non-destructive method it has sometimes been necessary to expend much machine work on a casting before a fatal hidden defect was revealed. Such wastefulness of labor is now avoided by the fluoroscopic inspection.

In the medical field we have seen an x-ray development take place during this war which will have great permanent value. It consists in the photography with the camera of the fluorescent screen image and, in the case of chest examinations, it will reduce the cost of the photographic film required to about one tenth that of the usual direct method of radiography and with but little sacrifice, we are told, in diagnostic value. This will make economically possible the chest radiography of all army recruits and the frequent chest examinations which are so desirable in the case of our young people. Many other important examples will come to light after the emergency.

Science institutions bring their votaries together, and so facilitate cooperative effort. The science laboratory and the scientific society alike facilitate the helpful interchange of ideas, thus giving both pleasure and assistance. Some individuals are by preference lone workers, but fortunately for human progress the scientist is usually a gregarious animal, taking pleasure in being with his own kind, that is, with those who can understand and appreciate his work. And by such contact he gives and receives help.

The question is sometimes raised as to whether the day of the lone scientific worker is past. While the answer is *no,* it is certain that with the great increase which has taken place in recent years in the number of science laboratories and in the number of people working in them, the percentage of our scientific progress due to the lone worker has undergone a corresponding decrease.

The science institution also helps by lending dignity to the profession of the scientist, thus playing no small role in scientific progress. The degree conferred by the institution is a badge of distinction which serves as a spur both to the acquisition of the knowledge of the past and to subsequent achievement.

In closing may I express the hope that the tradition of this laboratory, so auspiciously begun, may grow in stature and in luster with the years, and that it may be a credit to the founders of this institution and to the distinguished name this institution now bears.

Sir William Osler, lifelong advocate of medical research and himself one of its finest exemplars, in 1908, stirred by the shifting of the medical center of the world from Vienna to Berlin and by his longing to see it move again, this time across the Atlantic, wrote a letter in which he fancifully but eloquently quoted these words from "Minerva Medica":

> We Gods have but one motto—those that honor us—we honor. Give me the temples, give me the priests, give me the true worship—and I will come. . . . Where the worshippers are the most devoted, not, mark you, where they are the most numerous; where the clouds of incense rise highest, there must my chief temple be, and to it from all quarters will the faithful flock.

So now, as we dedicate this new altar to science, in the name of another great exponent of medical research, may we not feel that we are adding to the fulfilment of Osler's dream of a third of a century ago? Let us hope that here Minerva may find a new and welcome shrine, where the clouds of incense will rise ever higher, fed by an ever increasing and ever more devoted band of worshipers at the altar of truth.

SMITHSONIAN ENTERPRISES

By Dr. C. G. ABBOT

SECRETARY, SMITHSONIAN INSTITUTION

IN the main hall of the old brown-stone Smithsonian building are found several of the reasons why the Institution is being frequently called upon to assist the armed services. In this hall was opened, in January, 1941, an exhibit which presented all branches of Smithsonian interests in a striking way. At either end of the hall is a world map. One map displays the world-wide distribution of Smithsonian publications. The other shows that none of the seven continents nor the seven seas has failed to be the scene of many expeditions, for collecting or for basic investigations, in which the Smithsonian has worked alone or has prominently participated.

This world-wide scope of Smithsonian interests and knowledge, associated with the intimate acquaintance with the ethnology, resources, language and climatic

conditions of out-of-the-way places which many of its staff members have gained brings to the Institution a multitude of questions from the military services, now called to far-away shores.

In order to understand the favorable position of the Institution to assist in war enterprises, it is necessary to recall the unique nature of its organization. By the will of James Smithson, an Englishman who died in 1826, the Institution "for the increase and diffusion of knowledge among men" was conceived and endowed with his private fortune of $550,000. The old brown-stone building was erected from the early income of the Smithson fund. To the original endowment has been added, for general purposes, about $1,500,000 more by gifts from later donors. Besides these resources for general purposes, the Institution is the legal owner of the Freer Gallery of Art, its contents and endowment, and the National Gallery of Art and all the works of art it contains excepting loans.

The Smithsonian Institution is the ward of the National Government, ruled by a Board of Regents comprising the Vice-President of the United States, the Chief Justice, three Senators, three Representatives and six eminent private citizens selected by the Congress. The Secretary of the Board of Regents is the executive officer. Each of the five secretaries has been of international standing as a man of research and has exercised almost unlimited authority in guiding the operations of the Institution. From Smithsonian private initiative has arisen the National Museum, Zoological Park, Bureau of American Ethnology, Bureau of International Exchanges of scientific literature, Astrophysical Observatory and the three Galleries of Art, all now appropriated for annually in large measure by the Congress, but all entrusted to the administration of the private Smithsonian Institution. Several other government enterprises, including the weather service and the fisheries service, were initiated and carried on for many years by the Institution.

Thus with powerful government support, but with independent control of a small but highly useful private income, the Institution is in position to take up instantly at any time any project within the scope of its charter, "the increase and diffusion of knowledge," which lies within its available means. Also, from its cordial world-wide contacts it gives and receives cooperation from individuals and institutions far and near, unhampered by the restrictions which necessarily surround purely government operations.

Thus, when it was learned that the National Research Council, the Council of Learned Societies and the Social Science Research Council were considering jointly the possibility of setting up the Ethnogeographic Board for correlating information on the little known areas of world conflict, for the use of the armed services and other government branches, the Smithsonian Institution was able to help to start the project at once. It offered the salary of the director, an attractive office for his use, the assistance of one of its ethnologists and assured him of all the resources of knowledge stored up in the experience and learning of its staff.

Located in the great Smithsonian hall, the Ethnogeographic Board, Dr. William Duncan Strong, director, has functioned since July, 1942, and already has been called upon to the full extent of its facilities to meet the requests for special types of knowledge which come from various services of the government.

The vast collections of the National Museum and the facilities of other Smithsonian bureaus are also of great usefulness in the identification, study and provenance of strategic materials relating to national defense, such as rubber, tin, aluminum, mica, mercury, abrasives. The staffs contain experts and technicians with outstanding experience in many fields, and the laboratories and equipment are useful in building and testing instruments and furnishing special information. Some of its staff members, because of unique knowledge, have been drawn away on special missions to aid the war effort.

Among the outstanding events of recent time in the diverse fields of the Smithsonian Institution, the greatest by far is the opening and growth of the National Gallery of Art, gift of Andrew W. Mellon, and enriched not only by his own collection of famous objects of art but by the munificent gifts of Samuel H. Kress and Joseph E. Widener, and the choice loans from other art connoisseurs.

For present-day Washington, crowded with service men and workers in the executive offices, the National Gallery is a godsend. And the more so because through the generosity of Mr. Chester Dale it has been opened for months this year on Sunday evenings, with the added beauty of choice music. Thousands attend each Sunday, and the attendance grows and grows. It may not be generally realized that the National Museum and the Zoological Park each receive about 2,500,000 visitors a year, and that at present rates the National Gallery will not fall below them.

For five years the Smithsonian Institution cooperated with the United States Office of Education and the National Broadcasting Company in the weekly broadcast "The World is Yours." The programs were selected and edited by the Institution, and written, on material furnished by its experts, by a professional script writer employed by the Smithsonian. The popularity of the program remained undiminished, and twice within the past two years an official rating service placed "The World is Yours" at the top of all

non-commercial programs on all networks. Many will regret that owing to war demands the National Broadcasting Company has felt obliged to take this program off the air.

In cooperation with the National Geographic Society and with the good will of the Mexican Government, Mr. Matthew W. Stirling, chief of the Bureau of American Ethnology, has excavated sites in southern Mexico during the past three years. His work was very fruitful. Stelae carrying the earliest known dates in American archeology were found. Also a number of colossal portrait heads in stone, having most interesting negroid characteristics. At the very end of his digging in 1941, Mr. Stirling opened a cache of nearly a hundred jade objects, unprecedented in America.

Dr. F. H. H. Roberts, Jr., also of the Bureau, continued for several years the excavation of the Lindenmeier site in northern Colorado, rich in Folsom points and bones of extinct animals. He found evidences of occupation by men contemporaneous with post-glacial phenomena of perhaps 20,000 years ago. In one instance a Folsom point was found imbedded in the vertebrum of an extinct species of bison. Bones of camels and other extinct forms evidence the antiquity of these layers, some 15 feet below the present levels. The post-glacial age of the site was determined by cooperating geologists from Harvard University.

Another branch of science has received a valuable contribution from the Institution this year. Volume 6 of the Annals of the Smithsonian Astrophysical Observatory was published in April, 1942, by the generous provision of Mr. John A. Roebling, to whose support for twenty years the investigation is greatly indebted. Volume 6 contains a detailed account of the methods employed to determine the solar constant of radiation from observations in North and South America and Africa. A table of 78 quarto pages gives the daily determinations of the years 1923 to 1939, and is followed by a table of 10-day and monthly means. It is shown that the sun's output of radiation varies from day to day in close correlation with the areas of solar faculae. The rotation period of 27 days is well shown by solar variation. Fourteen long periods ranging from 8 months to 23 years are indicated. It is claimed that the weather, both from day to day and through seasons and years, is profoundly affected by these long- and short-range solar variations. As regards wave-length, it is shown that the sun's variations are slight for red and infra-red rays, and only of the order of 1 to 3 per cent. at maximum for total radiation. But the variation increases rapidly towards shorter wave-lengths, and becomes six times as great for ultraviolet rays as for total radiation.

Such are some of the recent enterprises of the Smithsonian Institution. It would be invidious to mention the outstanding services which individuals of its staff are giving to government services in this crisis, and it would unduly prolong this paper to speak of many other interesting operations of the Institution. Its usefulness is due in great measure to its unique character as a ward of government, endowed with a small but freely disposable private income, and looked upon with respect and favor, the world around, on account of its shining history of nearly a century.

OBITUARY

DAVID WILLIAM CORNELIUS

DR. D. W. CORNELIUS, head of the physics department at the University of Chattanooga until his retirement in 1941 on account of ill health, died on June 2, 1942, at Vincennes, Indiana, at the age of 57 years. For six years his health had become increasingly poor, the illness being finally diagnosed as cerebral arteriosclerosis, something for which medical science has as yet found no cure. In spite of a reduction in teaching duties in 1939, a leave of absence in 1940 and his retirement to emeritus status in 1941, Dr. Cornelius was unable to stem the development of the fatal disease. But throughout these trying times he maintained the same cheerful disposition which has endeared him to a host of acquaintances and friends.

Dr. Cornelius was born in Linton, Indiana, and was a graduate of DePauw in 1906. He did graduate work at the Universities of California and Illinois, receiving his doctorate from the latter institution in 1912. He served as assistant in physics at DePauw, Purdue and California, as professor of physics and engineering at Ottawa (Kansas), assistant professor of physics and astronomy at the University of Kansas, instructor in physics at Missouri University, and professor of physics at Alma College, until he was called to the University of Chattanooga as head of the physics department in 1920.

Dr. Cornelius is known chiefly as an inspiring teacher and for the many physicists who have received their college training under his careful guidance. His professional interests were numerous and he was a member and regular attendant of the various scientific societies in his field. He was a member of the executive council of the American Association of Physics