their absorption and secondary emission by solid substances. He showed that secondary emission of X-rays was of two varieties. In one of these the X-rays are scattered, without change of quality. The scattered rays were shown by examining tertiary emission to be polarized, and this was a fundamental result for the classification of X-rays with ordinary radiation, at that time doubtful. Professor Barkla's other kind of secondary emission is characteristic of the secondary radiator, and is accompanied by selective absorption of the primary rays. He showed that each chemical element emitted more than one definite kind of secondary fluorescent radiation. Concentrating attention on, say, the less penetrating kind, it was found to vary in quality by definite steps with the atomic weight of the secondary radiator.

REPORT OF THE YEAR'S WORK AT THE U. S. NAVAL OBSERVATORY

In his annual report to the Bureau of Navigation, Rear Admiral Howard, United States Navy, retired, superintendent of the Naval Observatory, says in part:

The time signals were sent out twice daily during the year, at noon and 10 P.M., seventy-fifth meridian time, both by land lines and by radio, through the operating relay at Radio, Va. The improvements mentioned in the last annual report have been completed and put in operation. The accuracy of the radio time signals, which can be picked up anywhere in the north Atlantic, has made it possible to reduce to one the allowance of chronometers for vessels of the Navy operating along the Atlantic coast.

The Naval Observatory has continued the policy of encouraging suggestions and developments of methods and instruments for navigation, particularly for submarines and aircraft.

The nautical-instrument repair shop has continued to prove economical in time and expense as compared with the previous system of having this work done by contract.

Owing to the great increase in ships of the Navy and the lack of receipt of materials and nautical instruments from abroad and the shortage of skilled labor in this country, especially in the manufacture of instruments and chronometers, the question of supply of instruments for navigation, especially chronometers, is becoming a matter of very serious proportions. The increased demand for the gyro-compass and the instruments attached to it is taxing the capacity of the only factory in this country which is able to manufacture this instrument.

Congress did not provide any addition to the clerical force, and it is earnestly recommended that the additional clerks which will be requested in the estimates to be submitted by the superintendent for the next fiscal year be approved and Congress urged to allow the same.

The scientific personnel has met twice each month, except during the summer, for the discussion of current astronomical topics and reading of papers by its members and scientists.

The astronomical work of this institution is now even more important than usual, owing to the European observatories losing many skilled observers due to the war.

Under the head of Aviation instruments and equipment, the report says:

As noted in the last annual report, the year started without any instruments or equipment for aviation, under the cognizance of the Bureau of Navigation, having been standardized.

Sets of clothing as used in the British and French aviation services were inspected at the observatory and at the aeronautic station at Pensacola, as well as sets manufactured by American firms. A board was appointed at Pensacola to specify a standard equipment and their report has been approved. The Bureau of Supplies and Accounts now has specifications for standard articles of clothing and personal equipment.

THE ENLISTMENT IN ENGINEER RESERVE CORPS OF TECHNICAL STUDENTS PENDING COMPLETION OF STUDIES

With the approval of the Secretary of War, Major General W. M. Black, chief of engineers, has promulgated regulations governing the creation of an Engineer Enlisted Reserve Corps, in which may be enrolled, pending completion of their studies, students of recognized technical schools. The announcement reads:

Under such regulations as the Chief of Engineers may prescribe a proportion of the students, as named by the school faculty, pursuing an engineering course in one of the approved technical engineering schools listed in the War Department, may enlist in the Enlisted Reserve Corps of the Engineer Department, and thereafter, upon presentation by the registrant to his local board of a certificate of enlistment, such certificate shall be filed with the questionnaire and the registrant shall be

placed in class V on the ground that he is in the military service of the United States.

In accordance with the authority given by this modification the following regulations are promulgated governing the enlistment by engineer students in the Engineer Enlisted Reserve Corps.

In order to be eligible for enlistment in the Engineer branch of the Enlisted Reserve Corps, under the above-quoted amendment to Selective Service Regulations, a candidate must fulfill the following conditions:

(*a*) He must be a citizen of the United States.

(*b*) He must be a student in one of the schools, the names of which are borne upon the list of technical schools approved by the Secretary of War for the purpose of carrying out section 5 of the river and harbor act approved February 27, 1911, relating to appointments from civil life to the grade of second lieutenant in the Corps of Engineers.

(*c*) He must be regularly enrolled and must be pursuing a course required for the degree of chemical engineer, civil engineer, electrical engineer, mechanical engineer, mining engineer, or some other equivalent engineering or technical degree.

(*d*) He must have made since his entry upon this course at the school a record of standing which will indicate clearly that he may be regarded fairly as deserving a place among the first third, based primarily on the scholastic records, of the young men who have graduated from that institution during the past ten years.

There follow forms of affidavits which are to be signed by the student and the president or dean of the school at which he is studying. The regulations continue:

In order to receive prompt consideration, applications from candidates now at college, and who are over twenty-one years of age, should be submitted so as to reach the office of the Chief of Engineers in Washington not later than January 15. The application from a person who has not reached this age at the present time must be submitted within three months before or one month after he reaches the age of twenty-one.

As rapidly as possible after the receipt of the applications in the Office of the Chief Engineers, they will be carefully examined, and the candidates whose applications are approved will promptly be sent cards of authorization, authorizing them to be enlisted in the Engineer Enlisted Reserve Corps by an office authorized to make enlistments in the Army, provided, of course, that they pass the necessary physical examination which will be made under the direction of the enlisting officer immediately prior to enlistment.

When thus enlisted the student's name will be placed on the "inactive list" of the Engineer Enlisted Reserve Corps, and he will be allowed to remain on this inactive list in order to enable him to complete his course at the institution.

Immediately after the completion of this course, or upon his discontinuance of the course for other reasons, the student will be given the option of being called into active service under his enlistment and being assigned to some one of the engineering branches of the Army, or of being immediately discharged and taking his place again among those subject to service under the draft.

SCIENTIFIC NOTES AND NEWS

THE War Department has established a Chemical Service Section and two lieutenant-colonels have been commissioned, Dr. Raymond F. Bacon, director of the Mellon Institute, Pittsburgh, to have charge of the chemical work in France, and Professor William H. Walker, of the Massachusetts Institute of Technology, to have charge of the work in the United States.

THE Perkin Medal Committee, consisting of members of the various chemical societies, has awarded the Perkin Medal for 1918 to Auguste J. Rossi of Niagara Falls, New York, in recognition of his work on titanium. The Perkin Medal was founded in 1906 by the New York Section of the Society of Chemical Industry to commemorate Sir William Perkin.

PROFESSOR A. RIGHI, professor of physics at Bologne, has been elected an honorary member of the British Institution of Electrical Engineers.

PROFESSOR T. B. WOOD, Drapers professor of agriculture in the University of Cambridge, has been appointed a member of the British Development Commission in succession to Mr. A. D. Hall, now secretary to the Board of Agriculture.

DR. ARTHUR KEITH, F.R.S., conservator of the Museum of the Royal College of Surgeons, has been appointed Fullerian professor of physiology in the Royal Institution.