tribution may be, the occurrence of satisfactory arrangements of initial distribution will become so rare as to make the passage of the spark practically impossible. Thus the minimum sparking potential while it may possess no real accurately fixed value assumes a definitely practically realizable value. With a critical field of this practical value the time lags were found by Zuber to vary from very short periods up to numbers of seconds and to be purely chance phenomena, there being no most probable interval of time lag for an electrode space under ordinary conditions. This is to be expected to follow as a necessary consequence of the fortuitous arrangement, or coincidences, of ionized electron paths. Until such an arrangement occurs no spark takes place, and its occurrence is purely a chance phenomenon which is more or less probable. If this fortuitous occurrence happens to lead to an irregular path instead of an ionization straight across between the electrodes the spark takes on the well-known zigzag form. Introduction of electrons near the cathode such as by ultraviolet light or radium, which are for this phenomenon after all relatively few in number, insures the fortuitous arrangement being more probable and consequently makes the long irregular spark lags less likely, as well as possibly lowering the minimum value of the sparking potential slightly. That such illumination at the *cathode* is more satisfactory than elsewhere follows from the direction of motion of the electrons, with the correspondingly longer paths that they have in the direction of the anode.

When intense fields are used such as in the overvoltage experiments of Pedersen,[12], Rogowski,[13] Torok[14] and Beams[15] the critical field strengths for the building up of adequate space charges in proper relation to each other are so far exceeded that far less fortuitous arrangements suffice for sparking and the amazingly short time lags observed can occur.

It is hoped that this suggestion of the mechanism of spark discharge which qualitatively at least seems to explain the rather contradictory observed facts will serve to stimulate some one more gifted in the mathematical handling of such a problem to attempt its solution and thereby help us understand a phenomenon whose mechanism has been sought for since the time of Franklin.

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RESEARCH AT MELLON INSTITUTE DURING 1928–29

DIRECTOR WEIDLEIN in the sixteenth annual report of Mellon Institute of Industrial Research has summarized the progress during the fiscal year 1928–29, the eighteenth since the establishment of the institute at Pittsburgh. The expansion in all activities may be taken as an indication of the extent to which the American manufacturer has become research-minded.

The services which the institute has rendered to industries during the year are the cumulative efforts of 173 senior industrial fellows, industrial fellows, and assistants. A more tangible expression of their results is given by 159 publications, including 25 United States patents, which appeared during 1928. The funds paid to the institute during the fiscal year exceeded $800,000, an increase of nearly $100,000 over the payments for 1927–28. At the close of the year sixty-two distinct problems were under investigation.

The growth of the institute during the year was made possible by the acquisition through gift from the founders, Messrs. Andrew W. Mellon and Richard B. Mellon, of properties which have been altered extensively to provide additional laboratories and offices.

Important results in solving manufacturing problems, in extending uses for industrial products and in creating new products and new processes of manufacture were obtained in the following fields: fertilizers, organic solvents and resins, molded paper articles, insecticides, foods, chrome plating, ceramic products, insulation, kiln studies and vitreous enamel. The institute's previous investigations (1911–14) (1923–24) on the abatement of the smoke nuisance have received wide recognition. This research is of such great importance, not only to the city of Pittsburgh but to every city, that the work has been reestablished.

The yearly renewals of fellowships by the donors are a source of gratification, since the carrying out of extended investigations of industrial problems requiring long periods of time for their solution has been one of the chief aims of the institute from the time of its foundation. One fellowship has been operating continuously since 1911, and one since 1914. Ten fellowships have been maintained for more than ten years, and seventeen additional fellowships for five years or more. In spite of the increase in size of the physical plant, the institute, because of lack of space, has been unable to meet the demands made upon it, and during the past year has been forced to decline investigations of importance.

The Department of Pure Research has a valued function. This department aids the industrial fellows by acting in an advisory capacity, but its major importance lies in the disinterested investigation of problems not suggested by industry. Without pioneer work in pure science, to serve as source material for applied science, the progress of technology would languish.

The Department of Pure Research has conducted its investigations along the following lines: the preparation and standardization of organic compounds of boron to be used by medical specialists in research aimed at the relief or cure of epilepsy; the synthesis of new hypnotics related to barbital and luminal; the synthesis of new local anesthetics of low toxicity related to anesthesine; the preparation and study of the chemical and physical properties of the ethers of ethylene and propylene glycols, some of which have since been shown to have importance as industrial solvents. The more recent problems of the department have been concerned chiefly with a study of the acidic carbohydrates in plants. The chemical nature of alginic acid has been determined and the acidic nucleus of gum arabic has been shown to be an aldobionic acid closely related to carbohydrate derivatives produced by certain pathogenic bacteria.

Within the entire fiscal year, February 29, 1928, to February 28, 1929, the total number of Industrial Fellowships in operation was 72—22 Multiple Fellowships and 50 Individual Fellowships. Eleven fellowships were supported by trade associations. The 173 scientists working on these problems, classified by the colleges or universities from which they received their highest degrees, represent 45 institutions located in 27 different states.

During the eighteen years since the establishment of Mellon Institute at Pittsburgh the total amount of money appropriated by companies and associations was $5,820,164. The contributions to scientific literature comprise 15 books, 89 bulletins, 471 research reports, 898 other articles and 391 United States patents.

LAWRENCE W. BASS,
Executive Assistant

MELLON INSTITUTE OF
INDUSTRIAL RESEARCH,
APRIL 25, 1929

SCIENTIFIC EVENTS

THE ITALIAN ACADEMY

ACCORDING to *The Christian Science Monitor*, the Italian Academy, which was formally established by royal decree on February 7, 1926, will be officially inaugurated on October 28, next, the seventh anniversary of the Fascist Revolution.

The academy is divided into four classes of members, fifteen for each class, who are eminent in any of the following four branches: History and moral science, literature, the arts and natural science, physics and mathematics. There will be a president, four vice-presidents, one at the head of each class, a general secretary and a treasurer. These members will form the academic council and will remain in office for five years.

The first thirty members of the academy have been nominated by royal decree, on the advice of the Prime Minister and of the Minister of Education; the remaining thirty will be nominated within three years at the rate of not less than ten a year. Membership is for life; the academicians will enjoy privileges and rank of high state officials, will wear a special uniform and will receive an annual salary of 36,000 lire.

The academy will hold regular sittings to discuss and promote the general interests of art, natural science and letters. It will grant research subsidies, traveling scholarships and will contribute toward the completion of scientific, literary and artistic works; it will in some cases assign pensions to authors, artists and scientists and to their dependents. The academy will be housed in the beautiful Renaissance palace, La Farnesina, and will receive an annual subsidy from the state. The institution of the academy has met with general favor; the Edison Electric Company of Milan has recently presented to the academy a sum of 10,000,000 lire to provide scholarships for foreign travel and scientific research.

EXPLORATIONS IN ALASKA

THE results of further explorations are described in the U. S. Geological Survey Bulletin 797-B, by Stephen R. Capps, in which the geography and geology of the Skwentna River country are reviewed. The report is accompanied by a map on a scale of about four miles to the inch, on which the drainage and the distribution of the rock formations are shown.

In a new, unexplored country, where streams are too swift for boating and the only trails are those of the wild animals, the surveyor must still use the primitive methods of transport—the pack-horse and the boat dragged by hand through water too swift for even a modern power-boat. Both of these methods were used by the Geological Survey expedition that in 1926 undertook to extend topographic and geologic surveys into the upper portion of the basin of Skwentna River.

The Skwentna is a large western tributary of the Susitna River and drains a hitherto unexplored area in the heart of the Alaska Range south and east of Rainy Pass. The party of four camp hands in addition to the topographer and geologist, with 16 pack-horses and 2 tons of supplies and equipment, was divided into two parts. The pack train, with four men, was carried by launch and scow from Anchorage, on the Alaska Railroad, to the west shore of Cook Inlet, to travel over a trailless country to the upper basin of the Skwentna River. The other men, with most of the supplies, provided with a shallow-draft