IT is announced that the Cleveland Clinic Foundation will receive the $400,000 estate of the late Frank Billings on the death of his widow.

ST. LUKE'S HOSPITAL and Washington University, St. Louis, are named in the will of Edward Mallinckrodt, chemical manufacturer, as preferred recipients of his estate, estimated at several millions, all of which he left to charity and education.

THE board of regents of the University of Michigan has authorized the establishment at the university of a department of graduate medicine, and has asked Dr. James D. Bruce to undertake its organization.

DR. WILER PENFIELD, assistant professor of surgery at Columbia University and neurological surgeon at the Presbyterian Hospital, has been appointed professor of neurological surgery at McGill University.

DR. JOHN C. FORBES has been appointed clinical chemist for the three hospitals of the Medical College of Virginia. Dr. William B. Porter, professor of medicine, has instituted the new clinical chemistry laboratory with Dr. Sidney S. Negus, professor of chemistry, assisting in the details involved.

DR. JOHN A. MCGEOCH, of Washington University, has been appointed acting professor of psychology for the summer session of 1928 at the University of North Dakota.

DR. A. K. MACBETH, reader in chemistry at the University of Durham, has been appointed to the Angas chair of chemistry in the University of Adelaide.

PROFESSOR JACOB, of the University of Toulouse, has been appointed professor of geology at the University of Paris.

PROFESSOR FOSSE, of Lille, has been appointed to take the place of the late Professor Simon in the department of chemistry at the National Museum of Natural History at Paris.

DISCUSSION AND CORRESPONDENCE

APPLIED GEOPHYSICS

AT the present time that subject which may be termed pure geophysics is making, in some directions, rapid progress owing to the practical applications of geophysics to underground exploration. A financial magnate exclaimed to the writer in two consecutive sentences, "It is impossible to know what is underground," and "Any one who could tell what was underground would be worth millions upon millions." I assured him that neither of these extreme views was true, and reminded him of X-rays, and of radio or wireless and of their successes in revealing the unseen. An electro-magnetic explanation left him cold and weary, for finance, like government, is often in the hands of men extraordinarily ignorant of the world in which they live. They are, however, usually experts in arithmetic and human nature!

The geophysical methods employed are divided naturally into two groups. In the northern mining regions magnetic, electrical and electromagnetic methods prevail, and these regions are often hilly, rocky, mountainous. In the southern or Gulf of Mexico region, which is often flat, the underground irregularities—such as the salt domes on the flanks or tops of which oil is often found—are sought for with seismic, gravitational, magnetic and recently with electrical methods.

For the guidance of those who are looking for further information the following references will be helpful. We are promised at an early date a translation into English of Ambronn's excellent treatise[1] on geophysics. This is to be written up to date by the author, and to include a full bibliography. Most of our readers will already have read, with pleasure and interest, the recent report[2] of Dr. Mason, president of Chicago University, which summarizes his investigations in field and laboratory during the last four years. There is also a large five-volume treatise, four parts of which have appeared, "Lehrbuch der Geophysik," by Professor B. Gutenberg (Gebrüder Borntraeger, Berlin).

The U. S. Bureau of Mines at Washington has recently issued a small bulletin, Technical Paper 420, which gives a brief and concise summary, primarily intended for mining men, of the principles and methods and apparatus available. It may be noted that in fig. 17 a battery appears to be giving an alternating current, owing to the omission from the diagram of a commutator which is, however, clearly mentioned in the text. Further criticism is not given here because the present writer and his colleague, Dr. D. A. Keys, are the authors.

As regards electrical and electromagnetic methods it may now be fairly claimed that these have stood well the preliminary tests, and that next they must face the fiery ordeal of achieving their actual purpose of discovering, in a useful manner, the conductors which are below the earth, and of discerning, as far as possible, their size, shape, depth and nature. This is a searching demand! Some ore bodies, such as zinc blende, do not conduct better than the rocks surrounding them, and thus evade detection. Underground water may conduct sufficiently well to simulate an ore body, thus deceiving an enthusiast who would not

[1] "Methoden der Angewandten Geophysik," Dr. Richard Ambronn, Göttingen. (Theodor Steinkopff, Dresden and Leipzig.)

[2] "Physical Exploration for Ores," Dr. Max Mason. (Physical Exploration Corp., 111 Broadway, N. Y.)

be fooled by surface water. A thin rich vein of worthless pyrites might prove an exciting discovery to a geophysicist, while the mine manager would view it with cold disdain.

The fact, however, remains beyond a doubt that good conductors can be located underground by several different electrical and electromagnetic methods, while they could not be detected by magnetic methods, and that suitable schemes may, and probably will, prove to be of great service alike to mining men and to geologists.

In games like golf and billiards, and in the more serious hazards of war by land or by sea, as much, or truly much more, depends on the man than upon the clubs, cue, weapons and ships—on the material things which he has at his disposal. For the expert and skilful man will insist on using to the utmost the very best, and on its maintenance at the very best. So too in geophysics a torsion balance, or a magnetometer, does not make a survey. These things are subsidiary to the skill and intelligence of the man who uses them, who understands their possibilities and limitations, who interprets their readings wisely. Since these things are true, the greatest country or state will always be that which develops most properly the real intelligence of its children and youth—always the sole greatest asset of any people.

To return to our main subject—geophysical prospectors sometimes claim too much, mine managers often expect too much. Disappointment leads them to join the scoffers. That is not the road to progress! There must be mutual confidence and cooperation between managers, engineers, geologists and physicists. So far none of them has proved infallible; all have to play the game of "blindman's buff" or "hoodman blind." All have to search with all the scientific aids possible. Diamond drills can not be used over the whole face of the earth. The day may come when the geologist will go before, and the geophysicists will follow after, next come the engineers with diamond drill, and behind them all the other men who, with joy and singing, will gather up most of the dollars.

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THE MULTIPLE ORIGIN OF TUMORS

PARTLY from clinical observation, partly from the intensive experimental work on neoplastic disease which has been carried on during the last quarter century, we now know of a considerable number of means by which tumors, particularly malignant tumors, may be artificially induced. These come under several distinct categories.

First, certain chemical irritants may induce them with some regularity. Coal tar applied to the skin over long periods of time, or injected into the tissues; indol; various arsenic compounds; and—a matter here of clinical observation—various aniline products —all have the effect of stimulating tissues to malignant hyperplasia, in some cases at least preceded by a period of benign overgrowth.

Second, physical irritation, best manifested by long applications of the X-ray, has the same effect. Third, embryonal tissues introduced into the adult animal may in certain circumstances develop into malignant tumor; best, perhaps, when to the effect of transplantation is added the element of chemical irritation, as by coal tar or indol. Fourth, malignant tumors may develop, as shown by Maud Slye, purely on the basis of hereditary factors. We may have malignant tumors induced by certain nematode parasites, acting in a manner as yet not fully determined. And finally, rather recently it has been shown by Blumenthal and his coworkers that in a certain proportion of human cancers *B. tumefaciens* may be isolated from the outskirts of the tumor. This, grown in pure culture and inoculated into plants and certain animals, may cause what to all appearances are tumors in them. In the case of the animal inoculations, sections show a fairly definite picture of malignant neoplastic growth, and on transfer to other animals of the same species the new growths behave like typical inoculable tumors. Of some significance in this connection is the fact that the organisms disappear in the later stages of the tumor, and in those resulting from transfer.

Instead of being in ignorance of the causative factor of neoplastic growth, we are really in a position of embarrassment at having too many possible causes, and the real problem in connection with the etiology of tumors would appear to lie in the reconciling of these to a single common factor. That there is such a common factor can not be questioned; the entire picture of neoplastic disease, both benign and malignant, is too definite to permit doubt on that score. As a matter of fact, the nature of that factor is shown in the histology of all tumors—it lies in their common possession of the property of more or less unrestricted growth—absolutely unrestricted in the case of the more malignant ones.

Viewed in this light, neoplastic proliferation must then be considered as a common type of reaction to a variety of causes—a reaction characterized by the more or less complete suppression of the usual normal balanced cellular activities with a corresponding accentuation of the single activity of cellular multiplication. In the sense of being a reaction to injury, tumor development would then be simply a special type of inflammatory phenomenon—one which is shown originally by the single cell or group of cells, as a result of which it loses its normal environmental