study, fuller examinations will be made, and the results will appear in the publications of the Carnegie Museum. O. A. PETERSON.

CARNEGIE MUSEUM, PITTSBURGH,
August 18, 1904.

QUOTATIONS.

THE CANCER RESEARCH FUND.

AMONG the facts established by the report is that cancer can be successfully transplanted from any animal into another animal of the same species, but not into an animal of a different species; and this inoculability, so to speak, will hereafter be largely utilized for the purpose of obtaining cancer patients. A single cancer may in this way be passed on, so to speak, through several generations of animals, the original growth and those arising from it surviving all the hosts in which they have successively found the materials for their support; and it is further remarkable that the growth of cancer is found to be of a character unlike the growth of an individual. Every individual life, whether of plant or animal, springs from the union of two parent cells; but, when this union has been effected and the life of the new individual has commenced, its future growth is provided for and maintained by a simple division and subdivision of the cells entering into its several structures. In the case of cancer, however, it has been found that cell conjugation is continuous, and that the growth as a whole may therefore be regarded as a colony of individuals producing offspring, rather than as a part of the tissues of the subject in which it grows. It is so far definitely parasitical in its character; and it is suggested that the means of arresting it may probably be found in the employment of some method by which the cell conjugation occurring in its mass may be prevented. The inquiry will be pursued in this direction; but, while the bulk of the inoculation experiments hitherto instituted have been in small animals, and chiefly in mice, it will be necessary to use larger ones, of species whose life histories have been more carefully studied, for the purpose of investigating methods of treatment likely to prove applicable to the human subject. Perhaps all that can fairly be said, at this stage of the inquiry, is that the ground has been cleared of much error, and that paths apparently leading towards future progress have been brought to light.

It must be regarded as a matter for much congratulation that the evidence so far obtained does not confirm the popular belief in the increasing frequency of cancer; although Sir William Church, in his speech moving the adoption of the report, was careful to indicate that no absolute conclusion could be reached in relation to this part of the subject. The statistics obtainable, especially with regard to the past, are not sufficiently trustworthy to justify the formation of positive conclusions; while the improvements recently effected in microscopes, as well as in the methods of preparing tissues for examination, have rendered it more easy now than at any former time to pronounce authoritatively on the cancerous or non-cancerous character of any growth that is either removed from the living body or discovered after death. It will be seen from the abstract of the report that a considerable percentage of cases of suspected cancer have been discovered, on microscopic examination, not to be of that character; and the superintendent, Dr. Bashford, points out that this affords a probable explanation of a good many reputed 'cures' of the disease. A fact of equal importance is that really cancerous growths are not attended in their early stages by any special symptoms from which their character can be detected with certainty; and on this the report founds a strenuous recommendation that all growths which are even possibly cancerous should be removed by operation without delay.—The London *Times*.

NOTES ON INORGANIC CHEMISTRY.

RADIUM AND RADIOACTIVITY.

THE study of radium and radioactivity continues with unabated zeal, and new light is being continually thrown upon the subject. Naturally Sir William Ramsay must be recognized as one of the foremost workers, and whatever comes from him carries great weight. For this reason great interest attaches to a recent communication of his in the *Comptes Rendus* on the radium emanation, for

which he suggests the name *exradio*. Obtaining this radiation from a specimen of radium bromid, he finds that it possesses the properties of a gas, obeying Boyle's law, being condensed at a low temperature and having a vapor pressure still appreciable even at the temperature of liquid air. The gas, which is at first strongly luminous but only temporarily so, seems to be a member of the argon group, having a density of about 80. If monatomic this would give an atomic weight of about 160. This is but little less than would be expected for the next eighth group element above xenon, and it may turn out that the inert elements of this group present the best development found in the periodic table. From the fact of its large atomic weight it is clear that in the break up, if such there be, of each radium atom, but a single atom of the emanation is formed. The quantity of the gas available was but 0.0254 cubic millimeter, but this proved sufficient to obtain the volume-pressure relations.

In another paper in the *Proceedings* of the Royal Society, Ramsay and Soddy describe more fully these and other experiments. In numerous instances the helium spectrum appeared at once in the radium bromid emanation; in other cases the line D_3 appeared after one to three days, and later the complete helium spectrum. Fifty milligrams of radium bromid produced 0.5 cubic centimeter gas per day, chiefly hydrogen and oxygen in the proportion to form water, the remainder being almost entirely air. The amount of helium given off in sixty days was 0.1 cubic millimeter. From this it was calculated that a gram of radium would give off in a year 0.0022 milligram of helium. Since argon lines were noticed in the spectrum, the possibility is not absolutely excluded that both argon and helium *could* have come from an external source. The change in volume of the emanation was twice measured in minute capillary tubes. In one case it increased, in the other decreased. The tubes showed a brilliant helium spectrum. The amount of gas formed from the emanation was about 3×10^{-6} cubic millimeters per second per gram radium; the rate of decomposition of the emanation 3×10^{-11} cubic millimeters per second. The mean life of a radium atom is calculated as a little more than a thousand years. A cubic centimeter of the emanation would evolve eventually in complete decomposition 7.4×10^6 kal. and one gram of radium 10^9 kal., while one cubic centimeter of an oxygen-hydrogen mixture develops only 2.04 kal.

In a paper in the *Berichte*, Herbert N. McCoy discusses the decomposition of radium from the standpoint of the law of mass action. He considers the order of decomposition to be

$$Ur \rightarrow UrX \rightarrow Ra \rightarrow RaEm \rightarrow EmX \rightarrow He.$$

Since radium loses one thousandth of its mass per year, it must itself be the product of some mother substance which is itself decomposing at a much slower rate. This substance is uranium, which is always associated with radium. The content in radium must have reached a maximum in all ores which are more than 5,000 years old, and from this time on there must be a constant ratio between the uranium and radium. The radioactivity of all uranium ores should then be proportional to their content of uranium, and this McCoy finds to be the case. This has also been found to hold in a large number of minerals by B. B. Boltwood, an abstract of whose recent paper on the subject has lately appeared in SCIENCE. The activity of pure uranium salts is relatively only one fifth of that of uranium ores, owing to the fact that the latter contain also the intermediate and the decomposition products. The relative quantity of uranium X, radium emanation and emanation X to the amount of radium in any case is exceedingly small, owing to the rapidity with which they decompose. The ultimate decomposition product, helium, is a constituent of all uranium ores, but owing to diffusion its quantity bears no direct relation to the quantity of uranium in the ores. The absolute proportion of radium to uranium in ores is about one part radium to 300,000 parts uranium. The decomposition of thorium is analogous to that of uranium, but about one millionth part as rapid.

Curie and Labord have examined a large number of mineral springs from the standpoint of radioactivity and find great varia-

tions, the water from Gastein, for instance, being nearly a hundred times as active as that from Vichy. The activity of a water is greater at a spring than that of the same water after keeping for some time. The gas from a spring is often strong enough to blacken a photographic plate after several hours' exposure, though the intensity of action is very small in comparison with that of radium itself. The authors raise the question as to whether it is possible that the therapeutic action of certain waters can be connected with their radioactivity.

Bouchard, Curie and Balthazard have experimented upon the physiological effect of the emanation, and find that it has a marked toxic action on inhalation, producing intense congestion of the lungs. The tissues after death show a decided radioactivity.

Veneziani has tested the action of radium rays upon the protozoon *Opalina ranarum* from the intestinal canal of the frog. While the organism dies very soon after removal from its normal habitat, under the influence of a radium preparation of 10,000 units it lives much longer and preserves its activity. From this the author concludes that while radium often has a destructive influence upon the living cell, this action is by no means uniform, and the radium may sometimes have the opposite effect.

The great sensitiveness of recent methods of detecting minute quantities of emanations and infinitesimal radioactivity is compared by Berthelot with the sensitiveness of the nerves of smell for certain odors. For example, he cites the odor of iodoform, which can be recognized in quantities as small as one hundred billionth of a gram. In such a case a distinct odor could be perceived even though a gram of the substance would not lose a thousandth part of its weight in hundreds of years. He calls attention to the risk of inferring from spectroscopic methods the change of one element into another, inasmuch as the sensitiveness of the spectroscope belongs to the same order of delicacy. It is well possible that the indication of spectral lines of one element might appear in the spectrum of another, owing to the presence of an infinitesimal amount of the element as an impurity.

J. L. H.

ANCIENT NATURAL HISTORY LORE.

AN interesting article is contributed to *Nature* (Vol. LXX., p. 207) by Dr. R. Lydekker on portraits of mammals preserved in ancient Egyptian inscriptions. The amount of research which has been carried on in this line of late years is considerable, the most elaborate contribution being the recently published memoir of Lartet and Gaillard on the mummified animals of Egypt.* To the zoologist these investigations are valuable chiefly for their bearing upon questions of geographical distribution and minor variation, but to the archeologist their interest is much greater and more general.

In calling attention to the fact that no mean harvest of information may be gleaned from this ancient field, it goes almost without saying that a rich reward awaits him who will critically reexamine and collate the mass of fact contained in classic writings on natural history, though it is clear the task of eliminating fancy, fable and rank superstition is not an easy one. That a good beginning has already been made, so far as relates to the more familiar animals, will not be disputed by any one who has examined Otto Keller's 'Thiere des classischen Alterthums' (Innsbruck, 1887), a work of great interest alike to the naturalist and antiquarian. This book, however, falls short of completeness, the omissions including even such important creatures as the lion, elephant and rhinoceros.

Regarding the lion in particular, it must be confessed that the grossest ignorance and misconceptions prevailed not only in classic times, but until well along in the middle ages. One of the most surprising fallacies entertained concerning both the lion and panther was that parturition occurred but once during lifetime, each pair producing a single cub, and each generation consequently being not more than half as numerous as the preceding. The theory of spontaneous generation came in

* *Archives Muséum d'Hist. Nat. de Lyon*, Vol. VIII., No. 2, 1903.