may not act till the cloud is discharged. Consider a cloud electrified slightly; the mists and clouds in its vicinity begin to coagulate, and go on till large drops are formed, which may be held up by electrical action, the drops dancing from one cloud to another and thus forming the very dense thunder-cloud. The coagulation of charged drops increases the potential, as Prof. Tait points out, until at length—flash—the cloud is discharged and the large drops fall in a violent shower. Moreover, the rapid excursion to and fro of the drops may easily have caused them to evaporate so fast as to freeze, and hence we may get hail.

While the cloud was electrified, it acted inductively on the earth underneath, drawing up an opposite charge from all points, and thus electrifying the atmosphere. When the discharge occurs this atmospheric electrification engages with the earth, clearing the air between, and driving the dust and germs on to all exposed surfaces. In some such way also it may be that "thunder turns milk sour," and exerts other putrefactive influences on the bodies which receive the germs and dust from the air.

But we are now no longer on safe and thoroughly explored territory. I have allowed myself to found upon a basis of experimental fact a superstructure of practical application to the explanation of the phenomena of nature and to the uses of man. The basis seems to me strong enough to bear most of the superstructure, but before being sure it will be necessary actually to put the methods into operation and to experiment on a very large scale. I hope to do this when I can get to a suitable place of operation. Liverpool fogs are poor affairs, and not worth clearing off. Manchester fogs are much better and more frequent, but there is nothing to beat the real article as found in London, and in London if possible I intend to rig up some large machines and to see what happens. The underground railway also offers its suffocating murkiness as a most tempting field for experiment, and I wish I were able already to tell you the actual result instead of being only in a position to indicate possibilities. Whether anything comes of it practically or not, it is an instructive example of how the smallest and most unpromising beginnings may, if only followed up long enough, lead to suggestions for large practical application. When we began the investigation into the dust-free spaces found above warm bodies we were not only without expectation, but without hope or idea of any sort, that anything practical was likely to come of it: the phenomenon itself possessed its own interest and charm.

And so it must ever be. The devotee of pure science never has practical developments as his primary aim; often he not only does not know, but does not in the least care, whether his researches will ever lead to any beneficial result. In some minds this passive ignoring of the practical goes so far as to become active repulsion; so that some singularly biased minds will not engage in anything which seems likely to lead to practical use. I regard this as an error, and as the sign of a warped judgment, for after all man is to us the most important part of Nature; but the system works well nevertheless, and the division of labour accomplishes its object. One man investigates Nature impelled simply by his own genius and because he feels he cannot help it: it never occurs to him to give a reason for or to justify his pursuits. Another subsequently utilises his results, and applies them to the benefit of the race. Meanwhile, however, it may happen that the yet unapplied and unfruitful results evoke a sneer, and the question, "Cui bono?" the only answer to which question seems to be: No one is wise enough to tell beforehand what gigantic developments may not spring from the most insignificant fact.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

OXFORD.—The following are the University and College lectures in natural science for the summer term:—

In the Physical Department of the Museum Prof. Clifton lectures on the instruments and methods of measurement employed in optics; Mr. Heaton lectures on problems in elementary physics; and practical instruction is given by the Professor and Messrs. Heaton and Walker. At Christ Church Mr. Baynes lectures on conduction of heat, and gives practical instruction on the measurements of electricity and magnetism; at Balliol Mr. Dixon lectures on elementary electricity and magnetism.

In the Chemical Department of the Museum Dr. Odling will hold an informal discussion on chemical constitution, Mr. Fisher lectures on inorganic and Dr. Watts on organic chemistry. At Christ Church Mr. Harcourt lectures on quantitative analysis and Mr. Veley on the relation between the physical properties and the constitution of organic compounds.

In the Morphological Department of the Museum Prof. Moseley lectures on the relations of the anthropoid apes and man, Mr. S. Hickson on the embryology of the chick, Mr. Jackson on Osteological Types, Mr. Poulton on Descriptive Histology, Mr. Morgan on Odontography, and Mr. Barclay-Thompson on the Anatomy of the Sauropsida.

In the Physiological Department Prof. Burdon-Sanderson lectures on the Chemical Processes of the Animal Body; at Magdalen Mr. Yule lectures on Practical Physiology.

Prof. Prestwich lectures on the Strata in the Neighbourhood of Oxford, and gives practical instruction in the field on the days following his lectures.

Prof. Gilbert will give an introductory lecture on May 6, on the Sources of the Constituents of Plants—the Soil, the Atmosphere. Dr. Tylor lectures on the Development of Arts and Sciences.

Prof. Pritchard concludes his course on the Planetary Theory, and will give a public lecture on his recent journey to Egypt in order to measure the absorptive power of the atmosphere on the light of the stars.

SCIENTIFIC SERIALS

American Journal of Science, April.—Recent explorations in the Wappinger Valley limestone of Duchess County, New York, by Prof. William B. Dwight. To the paper is appended a plate of the Wappinger Valley fossils.—Description of the Kettle-Holes near Wood's Hall, Massachusetts, with map of the district showing the positions and direction of the larger diameter of the Holes, by Prof. B. F. Koons.—Examination of Mr. Alfred R. Wallace's modification of the physical theory of secular changes of climate (second paper), by Dr. James Croll. Here the question is studied from the physical standpoint, and it is argued that a geographical change in the crust of the earth is not necessary to remove the Antarctic ice.—A contribution to the geology of Rhode Island (continued), by T. Nelson Dale.—On Mesozoic Dicotyledons (Angiosperms), by Lester F. Ward.—On the tourmaline and associated minerals of Auburn, Maine, by George F. Kunz.—On andalusite from Gorham, Maine, by the same author.—On the white garnet from Wakefield, Canada, by the same author.—Horizontal motions of small floating bodies in relation to the validity of the postulates of the theory of capillarity, by John Le Conte.—The principal characters of American Jurassic Dinosaurs; Part vii., the order Theropod (with plates 8 to 14), by Prof. O. C. Marsh.—A new order of extinct Jurassic reptiles (*Macelognatha*), (one illustration, *M. vagans*), by the same author.

THE first article in the *Journal of Botany* for April is a monograph, by Dr. Masters, on the singular "umbrella pine" of Japan, *Sciadopitys verticillata*. The most important points which he brings out are that the true leaves of *Sciadopitys* are the homologues of the true or primordial leaves of *Pinus*; that the so-called "needles" of *Sciadopitys*, although occupying the same relative position as the leaves of *Pinus*, are not necessarily morphologically homologous with them; and that the bracts of the cone of *Sciadopitys* are homologous with the true leaves of that plant, and also with the bracts of Abietineæ generally.

THE most important article in the *Nuovo Giornale Botanico Italiano* for January 1884 is one by Sig. A. Borzi, on a parasitic organism of a very low type which he finds in the ordinary cells of *Spirogyra crassa*, and to which he gives the name *Protochytrium Spirogyræ*. In its systematic position it displays, on the one hand, affinities with the Myxomycetes, on the other hand, with such genera of Chytridiaceæ as *Woronina*, *Rozella*, and *Olpidiopsis*. The entire absence of a cell-nucleus identifies it, according to the author, with Klein's family of Hydromyxaceæ, along with *Monas*, *Vampyrella*, *Monadopsis*, and *Protomyxa*. Its ordinary condition is that of a naked mass of protoplasm, endowed with amœboid movements, and living on the chlorophyllaceous contents of the cells of the host, these plasmodia having the power of coalescing like myxamœbæ; but it also has an encysted state, and in certain conditions propagates itself by the production of uniflagellate zoospores.

Rendiconti del Reale Istituto Lombardo, March 6.—Observations made at Milan on the passage of the atmospheric waves produced by the Krakatoa eruption, by E. G. Schiaparelli.—On