

we are told nothing about the nature of the notes, nor about those written in a copy of the work of Copernicus (the Basle edition of 1566), which are also supposed to be in Tycho's hand.

One of the finest Tychoniana at Prague is a copy of the original edition of the "Astronomiæ Instauratæ Mechanica," printed (apparently in a small number of copies) in 1598. As in several other existing copies, the illustrations in this one have been coloured by hand, and there is a portrait inserted in it of which we are glad to be able to append a copy as well as a copy of the author's dedication to the Bohemian Baron von Hasenburg. As we have already remarked elsewhere ("Tycho Brahe," p. 263), this portrait does

PHYSIOGRAPHY AND PHYSICAL GEOGRAPHY.

THE progress of science, and human perversity, are jointly responsible for remarkable variations undergone by scientific words and terms with the lapse of time. Natural science, which once comprised all knowledge obtained by experiment and observation, now, as many think, only signifies natural history; physical science includes chemistry; physical astronomy is no longer the astronomy of Kepler, but that of the telescope and spectroscope; and physical geography is gradually assuming the name of physiography without acquiring the breadth of view which characterises this science. An

article by Prof. W. M. Davis in the *School Review*, published by the University of Chicago Press, brings this nominal metamorphosis prominently before us. Prof. Davis defines physical geography—or physiography—which he considers as synonymous, as "the study of those features of the earth which are involved in the relation of earth and man; that is, the study of man's physical environment." So far as physical geography is concerned, this statement of its boundary lines is satisfactory, but when Prof. Davis uses the definition as a touchstone to test the character of physiography as understood by the examiners for the Department of Science and Art, he employs a criterion having no logical basis whatever.

Though, unfortunately for precision of scientific expression, physiography is often taken to mean physical geography, especially in the United States, the two departments of knowledge ought to be distinctly recognised as separate and fundamentally different in scope. It is perhaps a little late in the day to insist upon the distinction, for a hybrid has been produced which has commendable features and gives hopes of fertility; but what we do object to is that the hybrid is being

used as a type-specimen, and its parents are being compared with it to their own detriment. To drop the metaphor, the physiography of South Kensington is criticised by Prof. Davis because it does not possess the points of virtue characteristic of physical geography in the sense understood by him. As he appears to be under a misapprehension as to the original use of the word and the scope of the subject—an obliquity shared, moreover, by many other physical geographers—it may be worth while to recall the circumstances which led to its adoption.

Until the year 1877 the Department of Science and Art held examinations in physical geography as generally understood. The Education Department also held

*Illustris ac Generoso Domino,*  
 DNO: IOHANNI LIBERO BARONI AD  
 HASENBURG, in Budin, Brojan, et Hoste  
 nit, SCLARENENSIVM Capitaneus,  
 S. Cesar: Maiestatis à Consilijs,  
 Domino et amico suo in  
 primis honorando.

*T. B.*

*Tycho Brahe*

FIG. 2.—Autograph Dedication by Tycho Brahe.

not offer much resemblance to those already published; but as Tycho himself distributed copies of it pasted into this magnificent book, we shall perhaps be justified in thinking that he considered it a good likeness.

Finally, Dr. Studnicka gives a picture of a sextant made by Habermehl, of Prague, in 1600, and which tradition insists must have belonged to Tycho, though it has none of the characteristics of his own instruments. Though this memoir does not bring out any new facts, the numerous illustrations in it are very interesting, and it is a pleasant proof of the veneration in which the memory of the great astronomer is held in the country where he finished his career.

J. L. E. D.

examinations in physical geography. Grants in aid of teaching were made for successful candidates by each Department; but it was found that many pupil teachers presented themselves for examination by the Department of Science and Art after they had passed the examination of the Education Department, and they thus earned grants twice over for the same subject. To avoid this duplication, it was decided to limit physical geography to the Education Department, and to give the subject under the Department of Science and Art a wider scope and call it physiography. The subject was instituted in place of physical geography by a minute of the Lords of Committee of Council on Education dated August 15, 1876, and the first examination was held in the following year, the syllabus having been drawn up by Sir Norman Lockyer. The deliberate purpose was to introduce a subject which was not physical geography at all, and to prevent candidates with a knowledge of physical geography only from scoring a success upon their knowledge in the examinations in physiography. If this is remembered, the unreasonableness of criticising the physiography of the Department of Science and Art from the point of view of the physical geographer is at once obvious. There is nothing to justify the occupation of this position, and the comparison made from it has no significance.

The general impression is that Huxley first used the word physiography in the sense in which latter-day advocates of physical geography like to understand it. Prof. Davis commits himself to this opinion in the remark that "the term physiography has been adopted [by the South Kensington authorities] because of Huxley's use of it as a title for a series of lectures in 1869 and 1870." Now, as a matter of fact, this statement is not correct. The subject of the lectures was, as Huxley's disciples know, the Thames and its basin; and when the lectures were published eight years later, some elementary information was added on the movements of the earth and the constitution of the sun, and the title of "Physiography" was given to the book thus brought into existence. This Huxley clearly stated in the preface to his inspiring volume, and he also remarked "I borrowed the title of physiography," but that is usually overlooked. In the interval between the delivery of the lectures and their publication, physiography was adopted by the Department of Science and Art as a subject for examination, and what Huxley really did was to give his book the title of the new subject. The same title—physiography—was used by Prof. Ansted for a book published shortly before Huxley's work.

It therefore appears that there is no justification for fathering the term physiography upon Huxley, or for using the contents of his book "Physiography" as an affidavit testifying to the devolution which the subject has undergone on account of the South Kensington examinations. An acquaintance with the actual circumstances which caused the introduction of the subject and the adoption of its title by Huxley would have enabled Prof. Davis to see the matter in a little better light than that in which he wrote his criticism.

It is, however, not the object here merely to show the weak points of a criticism; that is, after all, a small matter in comparison with the meaning which should be attached to the word physiography. Etymologically considered, physiography is the science which is concerned with the facts and phenomena of the whole of nature, and therefore embraces all the natural and physical sciences. The separate sciences have had their fields of activity staked out, and work is continuously carried on in them; but the boundaries are only marked here and there, and it becomes more difficult to define them every day. The amalgamation of all these interests in a company which aims at increasing natural knowledge, represents in a way the relation between the separate

sciences and physiography conceived in the widest spirit. Perhaps a philosopher will one day arise and produce from the discrete collections of scientific facts a structure in which all available material shall be fitted into its true place; and the monument thus erected should be called physiography. Or, using another simile, what is wanted is a Darwin who will trace the complete development of organic and inorganic sciences, and show the mutual relations between the stores of knowledge at present kept in different departments. The work in which this is done will be a work on physiography.

The complete co-ordination of scientific material can, however, only become possible when omniscience is reached; what the apostles of physiography have now to do is to preach the gospel of the study of all natural knowledge. He who limits the study to the causes and consequences of the various forms of the earth's surface is not concerned with physiography at all, but with physical geography. As was pointed out by Sir Norman Lockyer long ago, in passing from geography to physiography, we pass from *γη* to *φύσις*, from the earth to the universe, and unless that is borne in mind the view of physiography is restricted and unnatural. Considered in this light, the physiography of South Kensington examinations presents characteristics worthy of consideration. The subject includes the main fundamental principles of observational science, and the application of these principles to the study of the earth, the sun, moon, stars and other bodies in the universe. The physical environment of man is not considered as such, and though prominence is given to the earth's crust and the changes which take place in it, the point of view is largely physical, and physical causes rather than anthropomorphic consequences are included.

It will thus be seen that there is no pretence to make the physiography of South Kensington the field of physical geography, whether the latter expression is taken to mean the subject as conceived by the geographers of a former generation, or whether it is given the interpretation Prof. Davis puts upon it. It is of course open to any one to criticise the syllabus; but the point of view should be as much that of the physicist as of the geographer. And whatever is said, let it be borne in mind that the syllabus is the only one existing in this country to encourage the experimental study of the physical principles underlying astronomy, earth-knowledge, and meteorology. Whether it would be better, in view of the meaning attached to the word physiography in the United States, for the South Kensington examiners to discontinue their use of the term, and divide the subject into two, under the titles of physical geography and astronomy, must be left to the proper authorities to decide.

R. A. G.

#### NOTES.

WE learn from the *Times* that on Saturday last Prof. Slaby, of the Charlottenburg Technical High School, gave an interesting lecture before the Emperor of Germany and a distinguished company upon improvements which his former assistant, Count Arco, and himself have made in the art of wireless telegraphy. It has not hitherto been possible to use wireless telegraphy for communicating with several different stations at the same time. Prof. Slaby has now succeeded in overcoming this difficulty, and on Saturday night he communicated from the conference room of the General Electric Company in Berlin with operators in the laboratory of the Technical High School at Charlottenburg and in the works of the General Electric Company at Ober Schönweide. These two stations are distant about two and eight miles respectively from the conference room in which the experiment was conducted. Prof. Slaby used two instruments, both of which were connected with a lightning conductor in the neighbourhood. One of the instruments was made to syntonise exactly with that in the laboratory at Charlottenburg, the other