planation. Such a result might be expected when we consider the difficulties of the question. The student should understand that he must face the difficulties, and that he can not overcome them without serious study. A good analytical exposition will be found in the 'Mecanique' of Poisson. But the most satisfactory investigation of such motions is given by Poinsot, by means of the theory of couples. An interesting example is that of the precession and nutation of the equinoxes. If we form the couples around the earth's axis of rotation, around the line of equinoxes, and around the line in the earth's equator, directed toward the solstice; we find that the couple around the axis of rotation is zero; the couple around the line of equinoxes gives the precession; and the couple around the other axis produces the nutation. By substituting the force arising from the action of the sun, expanding by the binomial theorem, and retaining only the first terms, the solar precession comes out 15″.6 in a year. The calculation for the moon is not so easy because the moon does not move in the ecliptic; but, since we can compound couples like forces, there is no difficulty except the length of the work. The precession produced by the moon is 34″.8: hence the sum, or the luni-solar precession is 50″.4. Observation gives 50″.35; this simple method therefore gives a good approximation to the true value.

The mass of the earth disappears when we compound the couples, and the precession would be the same if the earth were a shell of the same figure. The precession has a secular character, since when we integrate we find a constant factor multiplied by the time. Again, since the precession is negative, the dynamical result shows that the earth is flattened at the poles, and not elongated as Cassini thought.

The nutation can be found in the same way from the couple around the third axis, but it has a periodical character, and changes sign with the longitude of the moon. The computed value agrees well with observation.

Poinsot's work is a remarkable example of what can be done by the careful study and examination of the geometrical conditions of a question.

A. HALL.

CAMBRIDGE, May 31, 1901.

MODULUS OF CONSTANT CROSS SECTION.

TO THE EDITOR OF SCIENCE: In the last number of SCIENCE there appears a short article with the above heading, in which the author says he can find no mention anywhere of a modulus of constant cross section. The modulus here referred to will be found in a number of treatises on elasticity, among others the article 'Elasticity,' in 'Encyclopædia Brittanica,' Vol. VII., p. 807, and Rankine's 'Applied Mechanics,' p. 279, where a numerical value is quoted for brass. If k be the volume modulus and n the rigidity modulus the modulus for constant cross section is $k + \frac{4}{3} n$.

The author may profit by the study of the thermodynamics of elasticity as given in the 'Britannica' article.

THOMAS GRAY.

ROSE POLYTECHNIC INSTITUTE,
May 27, 1901.

NOTE ON THE GENUS HOLLANDIA OF KARSCH.

IN reading over the sixth volume of the Cambridge Natural History (Insects) by Dr. David Sharp, p. 396, the writer notes the following statement: "The tropical African Arbelidæ are considered by Karsch to be a distinct family, Hollandiidæ."

Upon looking up the matter I discover that Dr. F. Karsch, in the twenty-second volume of the 'Entomologische Nachrichten' (1896), p. 137, erected a genus in honor of Dr. W. J. Holland, of Pittsburgh, calling it *Hollandia*, and selecting as the type of the genus the species named and described by him as *Hollandia togoica*. He further made this genus the type of a new family, the *Hollandiidæ*, to which he referred the genera *Hollandia* Karsch, *Arbelodes* Karsch, *Lebedodes* Holland, and *Metarbela* Holland.

Dr. Karsch unfortunately overlooked the fact that in the *Annals and Magazine of Natural History* for October, 1892 (p. 295), Dr. Arthur G. Butler had already described a genus of African moths, naming it *Hollandia*, in honor of the same gentleman, whom Dr. Karsch states it to be his wish to recognize. Dr. Karsch's name, therefore, falls into the list of synonyms together with the family name, which he has proposed.

The writer suggests for the genus described

by Karsch the name *Hollandella*. I am, like Dr. Sharp, unable to recognize characters of family value, and the distinction between the group, typified by the genus in question, and the generally recognized constituents of the family Arbelidæ appears to me to be of not more than subfamily importance. From this standpoint the nomenclature would be as follows: Family Arbelidæ, subfamily *Hollandellinæ*, genus *Hollandella*, etc.

I imagine that the change which I propose will not be displeasing either to Dr. Karsch, the learned custodian of the Royal Museum of Natural History in Berlin, or to my friend the Director of the Carnegie Museum.

THEO. GILL.

WASHINGTON, May. 1901.

CURRENT NOTES ON PHYSIOGRAPHY.

U. S. GEOLOGIC FOLIOS.

THE folios of the Geologic Atlas of the United States continue to furnish an unrivaled source of physiographic as well as of geologic information. Among the more recent, the following may be noted: The Monterey folio (Va., W. Va., Darton) exhibits the crowded Appalachians bordering the Allegheny plateau, a district of strongly corrugated strata now reduced to ridges and valleys of anticlinal, synclinal and monoclinal structure. Bristol (Va., Tenn., Campbell) includes a monoclinal belt with many overthrust faults, characteristic of the Appalachians in Tennessee; the mountains here are nearly rectilinear, in contrast to the sharp-turning zigzags further northeast. Between the mountains is an open country with many low ridges, once a lowland, but now dissected after a gently slanting uplift. Standingstone (Tenn., Campbell) presents a portion of the Cumberland plateau, with its ragged western escarpment descending to the 'highlands,' themselves dissected by streams that go to the lowlands next west. Uvalde (Tex., Vaughan) contains a part of the Rio Grande plain bordering the Edwards plateau whose dissected escarpment appears on the north. The plateau has yielded sand and silt with which the broad valleys of the plain are washed; here the streams frequently disappear and reappear, the Nueces river being an unusually large example of this kind. Elmoro (Col., Hills) shows the broad Plains that front the Rocky mountains near Trinidad to be surfaces of denudation, remnants of the removed strata being preserved under the lavas of Raton mesa; the Plains are now somewhat trenched by the streams. Fort Benton (Mont., Weed) gives another illustration of the great denudation by which the Plains have been formed, as testified to by the isolation of the Highwood mountains, an embossed body of dissected lavas and dikes; the larger river valleys of to-day are here sharply sunk beneath the Plains. Little Belt (Mont., Weed) affords an excellent illustration of the topographic consequences of the Neocene warping, for the modern deposits of Smith river basin (described as lacustrine, although consisting of irregularly bedded sands and loose conglomerates) overlap unconformably upon both the denuded central and marginal rocks of the greater Laramie deformation. Like the Highwood mountains, south of Fort Benton, the Crazy mountains, a network of dikes, here testify to the great erosion of the Plains that they overlook. Absaroka (Wyo., Hague) is characterized by the superb dissection of a high plateau of lavas and volcanic breccias; the whole region has been glaciated, and some of the valleys heading in great cirques seem to show glacial scouring in their smooth-sided, trough-like forms. Tacoma (Wash., Willis and Smith) includes examples of channels of ancient glaciers between uplands largely composed of drift; the channels now being invaded by the sea from without and by alluvium from within; the sounds are thus explained by retreat of the ice and not by depression of the land. Mother-Lode (Cal., Ransome) exhibits parts of the uplifted and dissected peneplain of the Sierra Nevada; it was strewn with gravels and flooded with lavas and volcanic conglomerates before uplift; it is now trenched by canyon-valleys. A few eminences surmount the uplands; several lava-capped table mountains standing up with long even-crested tops between the valleys.

RIVERS OF EAST YORKSHIRE.

THE subject of the Sedgwick essay announced by Cambridge University for 1900 was on the dependence of water-courses upon geological