omer Airy in 1827. Bifocals were invented and first used by Benjamin Franklin, 1785. As to the selection of the appropriate lenses, this was at first done by the peddlers who sold them. Physicians for a long time paid no attention to it. Even after the epochal work of the astronomer Kepler had opened a new era in optics by demonstrating the physiology of the act of vision, 1604, physicians maintained their reserved attitude and considered it below the dignity of their profession to have anything to do with the selection of glasses. It was only in the middle of the last century that the change took place. This was due mainly to the labors of Helmholtz and Donders, who laid the foundation for the adjustment of lenses according to mathematical and optical principles. The invention of the ophthalmoscope, by which the refraction can be determined objectively; of the ophthalmometer, which measures the astigmatism of the cornea; and the introduction of remedies, by which the accommodation can be paralyzed followed in rapid succession. By means of these instruments and methods of precision, the medical adviser is governed by well-established laws in the selection of spectacles, and this now belongs to the domain of science. The lecture was illustrated by a number of copies of old paintings and by drawings.

DISCUSSION AND CORRESPONDENCE.

GEO-BIOLOGICAL TERMS.

THE fundamental idea of *bios* is not conveyed by the new terms proposed by Dr. Dall in SCIENCE (No. 494) for indicating collectively 'land and fresh-water organisms.' By analogy with Leibnitz's protogæa, or the primordial world, epigæa would apply to the superficies of the earth, and the literal meaning of namatogæa is 'stream-world.' Correctly formed substantives are geobios and limnobios, proposed by Haeckel as the equivalents of terrestrial and fresh-water faunæ respectively. These may be readily combined in GEO-LIMNOBIOS; or, if an adjective form is desired, AQUA-TERRESTRIAL, or compounds of *terrestris* with *mare, fluvius, lacus*, etc., suggest themselves. *Aqua* having the general significance of fresh water (*aqua pluvia, aqua fontana, aqua cœlestis*, etc.) as opposed to salt, the distinction between aqua-terrestrial and marino-terrestrial is sufficiently obvious. Shorter than any of these, however, is the Greek adjective form, GEO-LIMNOUS.

Those who are in the habit of following the discussion of neologisms in SCIENCE may recall the sprightly flow of opinion that continued for some time in these columns (Vols. V. and VI.) in regard to certain physiographic extravaganza, such as 'Shickshinnies' for synclinal valleys, 'remolino' for pot-hole, 'cuesta' for hill-slope, etc. If we may be forgiven for appearing ironical, it deserves to be pointed out that some of the more euphuistic of the terms proposed about that time are preoccupied. For instance, a round dozen of soft Spanish exotics were imported by Arthur Schott upwards of fifty years ago (*Proc. A. A. A. S.*, 1856, p. 33), but for some reason they failed to germinate. Priority, strictly enforced, might quicken them with new life; then pot-hole, or 'remolino,' would acquire the chastened form of *tinaja*, the homely but expressive 'sink' would give way to *charco*, and base-level to *loma*. The first of these is defined as 'a water-hole in solid rock, usually met with in crevices and ravines of rocky mountains.' *Charco* is a name given to "water-pools found usually in lower and level places. They are formed either by the decay of rocks or by washing out of beds of clay." *Loma* is 'a long narrow mountain or hill-ridge, with a level horizon.'

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A REPLY TO CERTAIN CRITICISMS OF PROFESSOR GIARD RESPECTING THE BOPYRIDS.

PROFESSOR ALFRED GIARD, a master in the knowledge of the Bopyridæ, has done me the favor to examine and criticize the results of my recent studies on that group.* Professor Giard has aptly affirmed that a copy of Bonnier's volume 'Contribution à l'étude des Bopyridæ' (*a*)† ought to be found in Wash-

* See *C. R. Soc. de Biologie*, LVI., 1904, April 22, pp. 591–594.

† The letters in parentheses refer to the bibliography at the end of the article.

ington. Unfortunately none of the libraries here has been favored with his work,—not even the Smithsonian Institution, which is very liberal in the distribution of its publications throughout the world. It is to be regretted that the scientific institutions in France have not responded to the offer of exchanges from the Smithsonian Institution and as a result many of their publications are not to be had here. Before the publication of my 'Contributions to the Natural History of the Isopods' (*e*), I made every effort to secure Bonnier's work, without success. After writing to other libraries in this country, I have since succeeded in securing the loan of the volume from the Museum of Comparative Zoology at Harvard College.

With the humility of a disciple, I admit that I was in error (as I discovered before the criticism appeared) in considering that Giard and Bonnier had identified *Grapsicepon fritzi* with the species of *Bopyrus* found by Fritz Müller on an *Alpheus* (*c*). The name *Bopyrus alphei,* it appears, was given by Giard and Bonnier in 1890 (*b*) to the form found by Müller on a species of *Alpheus,* but as no description or figure ever appeared until those I gave in 1900 (*d*), ten years later, I think no zoologist would quote Giard and Bonnier as the authority of the species, a name without a description or figure not being usually accepted. I do not agree with Professor Bonnier in placing *Bopyrus alphei* in the genus *Bopyrella,* for I consider it a true *Probopyrus,* where I have recently placed it, the abdomen of the female being segmented. My figure is misleading, as it shows no segmentation, but, at the time it was made, I could not distinguish any segmentation in the specimen at hand, which was very transparent and colorless. Since receiving other specimens, I have been able to see distinctly the segmentation of the abdomen. In *Bopyrella* the abdominal segments are all fused.

During the short time that Professor Bonnier's work was in my possession, I was not able to examine all that it contains, but I noted the great similarity of my genus *Parapenæon* to his genus *Orbione.* I do not, however, consider my genus a synonym of *Orbione,* for it differs in not having the sixth segment of the abdomen of the female produced into pleural lamellæ, that segment in *Parapenæon* being very small and rounded. In the type species of *Orbione* the pleural lamellæ are produced to such an extent that they reach beyond the extremity of the uropoda. The second species of *Orbione, O. incerta,* described by Professor Bonnier, differs in this respect from the type species and may come under my genus *Parapenæon.* The author suggests that the second species of *Orbione* may represent a new genus. The female of *Parapenæon* agrees more with the female of *Cryptione* Hansen than it does with the female of *Orbione,* but the males in the two genera are very unlike. When the male of *Orbione* is known, there may be other characters to differentiate *Orbione* from both *Parapenæon* and *Cryptione.* At present *Parapenæon* is quite as distinct from *Orbione* as *Orbione* is from *Cryptione.*

Urobopyrus Richardson is certainly very close to *Palægyge* Giard and Bonnier, but can not be considered a synonym. In the female of *Urobopyrus* 'the uropoda are a pair of *double*-branched appendages attached to the terminal abdominal segment; the inner branches are smaller and more slender than the outer branches.' The female of *Palægyge* has small, *simple,* rudimentary, knob-like uropoda, not lamellar in shape nor elongated so as to extend beyond the terminal segment as is found in *Urobopyrus.*

In speaking of the thoracic processes in the adult female of *Argeia* as not being of epimeral origin, but arising from the posterior portion of the segment, I made the statement that it was incorrect to refer to them as 'lames pleurales.' My idea was not to suggest that Giard and Bonnier had confounded the 'lames pleurales' with the 'productions épimériennes,' but rather to point out that, in a strict sense, it is not exact to speak of them as 'lames pleurales.' They may be considered as the posterior divisions of the 'lames pleurales,' that view being now generally accepted, the anterior division of the 'lames pleurales' being placed lateral to the ovarian bosses on the anterior portion of the

segments. In *Argeia,* therefore, the 'lames pleurales' are in two parts, an anterior and a posterior part, and it is not exact to refer to these thoracic processes, which arise from the posterior portion of the segments, as the 'lames pleurales' of the segments.

In conclusion, I wish to state that I am not more willing to accept the 'loi naturelle' than I was to accept the 'hypothèse' postulated by Giard and Bonnier until its confirmation has been maintained by facts. Professor Giard states that I have not carefully studied *Argeia pugettensis* coming from different hosts. I hope soon to give in greater detail the results of my researches on this form and on *Bopyroides hippolytes.*

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HARRIET RICHARDSON.

SPECIAL ARTICLES.

AN ACCOUNT OF THE PRELIMINARY EXCAVATIONS IN A RECENTLY EXPLORED QUATERNARY CAVE IN SHASTA COUNTY, CALIFORNIA.

IN the summer of 1902 the writer was commissioned by the department of anthropology of the University of California to search for Quaternary caves in the belt of Carboniferous limestone exposed along the lower portion of the McCloud River. The work of that year led to the exploration of the Potter Creek cave which has already been described in SCIENCE.*

* Wm. J. Sinclair, SCIENCE, N. S., Vol. XVII., No. 435, pp. 708–712, May 1, 1903.

During the summer of 1903 further explorations were carried on by the writer under the direction of Professor J. C. Merriam, in the hope that caves of somewhat later age might be discovered. As a result of this work cave deposits containing remains of Quaternary mammals have been found in several new localities. Of these, the cave containing the largest quantity of remains is so situated with relation to the topography of the region as to indicate that it is younger than the Potter Creek Cave. To this cavern the name Samwel cave has been given, owing to the presence in it of a pool known among the Wintun Indians as 'Samwel,' or spirit water. An Indian legend to the effect that a Wintun maiden had fallen into a very deep well in the cave while searching for water led to the most important discoveries made here.

The Samwel cave is situated on the east bank of the McCloud River and about sixteen miles above its mouth. The entrance is on a Quaternary river terrace. Measurements kindly furnished the writer by Mr. J. S. Diller, who visited the cave with him, show this terrace to be 355 feet above the McCloud River and 1,505 feet above sea level. The entrance is a large, low arched vestibule leading to a series of galleries which widen again to large chambers.

The first chamber is about twenty-five feet long. At the southeast end a vertical fissure about thirty feet high extends twenty feet into the wall. The top is arched over and the bottom is filled with a deposit of clay and stalagmite containing many bones. The highest point on this deposit is near the middle of the fissure. From this place it fans out, fills the farther end and slopes down to the floor of the main chamber where it spreads out. It has been excavated to the depth of four feet, and is seen to be composed of several strata. The whole is covered by a stalagmite capping varying considerably in thickness.

Many remains were taken from this deposit. They include limb bones, vertebrae, teeth, jaws and a large number of splintered bones. In the deposit on the floor of the chamber, near the entrance of the fissure, a dis-