ment or moment, which movement continues until such particle meets an obstacle and the energy is again reconverted to heat, light and to those forms of obscure radiation, more or less penetrating to ordinary matter.

It is doubtful whether radio-active substances like radium are the fluorescent detectors of such rays as reach us from space, and which are not absorbed by our atmosphere. The simpler hypothesis is that of atomic instability. But the hypotheses which have been outlined above—and they are, of course, only scientific speculations or hypotheses as yet—naturally suggest lines of investigation which are desirable to be carried out. In that way only can any truth, if it exists in these ideas, be determined; or the ideas disproved, as the case may be.

ELIHU THOMSON.

A POSSIBLE USE FOR RADIUM.

ON the authority of M. Curie radium is worth about one million dollars a pound. This estimate is based on the cost of isolating this rarest, newest and most wonderful of the metals, rather than upon its uses to practical people.

Utilitarians may demand: 'Of what use is radium?' Sir Oliver Lodge has said this is difficult to answer for people who wish to make money out of it, but although at present radium grinds no axes, it is held in great estimation by physicists who see in its amazing energy possible solutions for old problems and materials for new ones. A British writer in the *Daily Graphic* of July 13 points out one direction in which a study of the properties of radium may prove of the greatest benefit to mankind, and that is the analogy between its rays and those of luminous insects. As Sir Oliver Lodge remarks, if we could discover the secret of the fire-fly's power to convert some unknown source of energy into light, we could produce light without heat.

Hope is expressed that the study of radium may lead us to a method of obtaining light in a cheaper and more convenient manner than any now known.

X.

SHORTER ARTICLES.

THE FISHES OF THE AFRICAN FAMILY KNERIIDÆ.

IN 1866 Dr. Steindachner introduced into the ichthyological system a peculiar western African fresh-water fish which he called *Kneria angolensis* and referred to the family Acanthopsidæ or Cobitidæ. Two years later (1868) Dr. Günther added another species from central Africa (*Kneria spekii*) and ranked the genus as the representative of a peculiar family—Kneriidæ. He placed it as an 'Appendix to the Cyprinidæ,' and there it has ever since been allowed to remain, but I have always felt convinced that it was not at all related to the Cyprinids or Plectognaths even. Very recently data have been acquired which may help us to a solution of the taxonomic problem.

In 1901 Dr. Boulenger made known a remarkable pigmy fish (30 mm. long) from the upper Nile (Fashoda) which he named *Cromeria nilotica* and referred to the family Galaxiidæ, thinking that it 'appears to be most nearly related to *Galaxias*.'

It is very unlikely that the tropical fish should be a member of a family all of whose certain representatives are characteristic of the cool and cold waters of the southern hemisphere and I was inclined to believe that it was really related to the Kneriidæ. An important paper just published by Dr. Swinnerton appears to confirm this view.

In the *Zoologischer Jahrbücher* (Anatomie) published in June, 1903 (pp. 58–70), Dr. Swinnerton has given an article on 'The Osteology of *Cromeria nilotica* and *Galaxias attenuatus*' and made known some extremely interesting results. It appears that there is no relationship between *Cromeria* and the *Galaxiids*, and that *Cromeria* belongs to a peculiar family remarkably distinct from any other known unless it be that of the kneriids. To that, indeed, it seems to belong. It has the same general form, the same arrangement of the fins, the projecting snout or upper jaw, the toothless trenchant jaws, the absence of pharyngeal teeth, the three branchiostegal rays, the very narrow branchial apertures, and the simple air-bladder. Indeed, in all essential

respects, *Cromeria* appears to agree with *Kneria*. There are, however, two notable discrepancies.

Kneria has 'the margin of the upper jaw formed by the intermaxillaries,' according to Dr. Günther, while in *Cromeria* Dr. Swinnerton found that 'both premaxilla and maxilla are small and edentulous,' and that 'the latter overlaps the former dorsally and enters largely into the formation of the gap.' In view of the very small size of the fishes and the ambiguous character of the mouth parts, the apparent difference may be rather nominal than real.

Kneria has its body 'covered with very small cycloid scales,' while *Cromeria* has the body 'naked.' Further, *Kneria* has a normal tail, while *Cromeria* has a membranous extension from the caudal above and below. It is possible that both of these characters may be indicative of immaturity (as analogous ones are in some other fishes) but it may be better for the present to assume that the two genera *Kneria* and *Cromeria* are distinct; that they are related there is little doubt.

The family, as represented by *Cromeria,* is so remarkably distinguished by osteological characters, especially the attachment of 'the greatly elongated arm of a bifurcated post-temporal to the supra-occipital bone,' that it should be isolated as the representative of a peculiar superfamily—Knerioidea. As Boulenger and Swinnerton have indicated, the scapular arch being destitute of a meso-coracoid, the group may provisionally be associated in the same great group as the pikes and killiefishes—Haplomi—or, perhaps better, in the group Iniomi, inasmuch as the family agrees with those fishes in their technical characters. Whether such an association would be natural will be for the future to determine.

THEO. GILL.

THE FLORA OF THE SERPENTINE BARRENS OF SOUTHEAST PENNSYLVANIA.

PARTS of Montgomery, Delaware, Chester and Lancaster Counties, Pennsylvania, are noted from a geologic standpoint for the presence of outcrops of serpentine rock. This rock formation is confined to the district southwest of the Schuylkill River, extending in a somewhat southwestward direction into Maryland, near the lower Susquehanna River. The largest outcrops near Philadelphia occur in the neighborhood of Lima, Delaware County, at Newtown Square, at places north and southwest of West Chester, while isolated patches exist south of Bryn Mawr and northwest of Media. There seems no doubt but that all the serpentines in southeast Pennsylvania are altered igneous rocks, either pyroxenites or peridotites.*

The flora of the serpentine exposures, which are always more or less barren in appearance, is peculiar. The eye of the botanist, or of the observant layman, is at once arrested by the association of the characteristic species which make up the serpentine flora, because it is sharply demarcated from the flora of the surrounding country. The botanist can identify the serpentine areas, where the rock is covered by a shallow soil, by the vegetation alone, for the species which are character plants, although occurring elsewhere in the region, are here grouped together in such a manner and in such number, as to delimit sharply these areas from the surrounding country. The serpentine plants taken together, therefore, form islands set down in a sea of other vegetation with a boundary as well characterized as the shore of an oceanic island, and with tension lines induced by the struggle for existence as sharply drawn as the shore line against which the storm waves beat. This sharp delimitation of the boundaries of the serpentine areas is emphasized by the fact that these areas are rarely cultivated, but are surrounded by rich cultivable land from which the original vegetation has been removed by man. Many of the plants found on the serpentines have survived, therefore, such vicissitudes and have persisted on the barrens, while the same species have been exterminated in the cleared land. This fact, however, does not militate against the unique character of the serpentine flora, because the forest, which exists on soils other than the serpentine, is

* Rand, Theodore D., 'Notes on the Geology of Southeastern Pennsylvania,' *Proc. Acad. Nat. Sci. Phila.*, 1900, p. 305.