description, or is it, as just suggested, the type specimen of the species *Polypodium Maximowiczii* Baker? The question itself shows the need of generic type specimens. My judgment is that in this case it should be Hance's specimen. He described a recognizable and distinct genus, and it would serve no purpose to render this genus nameless by showing that he was in error in the identification of the plant he based it on. He seems to have been correct; but there are very many known instances in which men have been wrong in such cases. The difficulty in the way of a rule sanctioning the recognition of Hance's specimen as the generic type is that such a rule would leave it impossible to locate any type for a great many genera.

*Campium,* Presl, Tentamen Pteridographiae (1836) 238, is a similar but more complicated case. The first species listed is "Campium punctulatum (Acrostichum punctulatum Presl nec Lin.)." I have reason to believe that this does not belong in the genus Presl described (it was based on a sterile specimen), and that *C. preslianum* (Fée), which Presl later accepted as a substitute name, is a different fern. Here, again, a standard species will standardize the genus. It will be *C. costatum* (Wallich) Presl, the second of the species listed and the only other one discussed or figured. In this instance the type almost must be Presl's specimen, in spite of his citation of Wallich, because the names in Wallich's List are now regarded as *nomina nuda.* There are still other possibilities: Christensen's view is that *Campium costatum* was left a *nomen nudum* by Presl.

One more example: *Hemigramma.*[2] This genus was published as comprising a single species, *Hemionitis Zollingeri* Kurz. By general present consent, this is a synonym of *Gymnopteris latifolia,* named by Meyen and described by Goldman, the proper name being *Hemigramma latifolia.* If the generic type is fixed by Christ's citation, the type of the genus is not the type of any valid species. If the generic type is that of the species Christ really founded his genus on, *H. latifolia,* it is a specimen Christ not only never saw, but which he explicitly regarded as a different fern. The actual, material foundation of Christ's diagnosis was a collection of specimens of which the first cited was *Borden no. 2124.* Taking this case by itself, the most reasonable view would be that the type specimen of the genus is Christ's specimen of Borden's collection. The objection to a rule to this effect has already been indicated.

I am very sure that we must come to the recognition of type specimens of genera. The question of what these types shall be, or at least the general principles underlying their fixing, will have to be decided by a congress, and the subject is brought up now to stimulate discussion, so that action by a congress may not be ill considered. What is the type of *Hemigramma?*

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[2] Christ, *Phil. Journ. Sci.,* 2c: 170, 1907.

## BIOLOGICAL CONTROL OF THE PRICKLY PEAR

THE brief account of the prickly pear work in Australia, given in SCIENCE of January 18, suggests the desirability of some additional comments. Last year I had the pleasure of visiting the experiment station at Sherwood, near Brisbane, and was able to see what was going on and have it all explained to me by Mr. Alan P. Dodd. I was especially struck by the thoroughness of the work, the careful survey of the enemies of *Opuntia* in various countries, and the extreme care taken to avoid introducing undesirable insects. Some insects which might be serviceable against prickly pear will occasionally attack other plants, and if experiments show that any such danger exists, they are not used. On the other hand, the safe and valuable species are pushed with vigor. The moth *Cactoblastis cactorum* has been known since 1885, when Berg described it from Argentina as *Zophodia cactorum.* The French entomologist Ragonot, in the Romanoff Memoires, 1901, established for it the genus *Cactoblastis.* It was introduced into Australia in June, 1925, and has already done marvelous work in the destruction of the prickly pear. About sixty million eggs have recently been distributed, and from now on it is expected to distribute at least one hundred million a year, as long as may appear necessary. The one fear is that some native or introduced insect may take to preying on *Cactoblastis* in such numbers as to nullify its work, but so far nothing of the kind has happened. The genus *Cactoblastis* has one other species, described by Dyar, which occurs at Mendoza, Argentina, and has not been imported. Last year Dyar named a third (*D. leithella*) from Curaçao in the Dutch West Indies, the distinction resting wholly on the habits and appearance of the larva, as described by the collector, Mr. Leith F. Hitchcock.

The intensive study of *Opuntia* insects has brought out a number of facts of great biological interest, and suggests the desirability of promoting other studies of the same type, whether of immediate economic significance or not. Thus the whole subject of the cochineal insects (*Dactylopius*) has taken on a new aspect. Having paid much attention to these insects in former years, I can testify that morphologically the several forms are very much alike, so that the number of species has been in doubt. But Dodd and

his colleagues find that their habits are different. The destruction of the prickly pears in the course of a few months by the species called *Dactylopius tomentosus* has been amazing; the more so, because in its native country this species never works such havoc. But it is found that different cochineals infest different species of *Opuntia*. The Indian cochineal (really American, but imported into India and Ceylon) attacks *Opuntia monacantha*, but refuses all other species of these cacti. The cochineal common in our southwest, *Dactylopius confusus*, similarly restricts itself to certain species, though not to a single one. Still another sort, *D. newsteadi*, is as efficient against *Opuntia imbricata* as *D. tomentosus* is against *O. inermis* and *O. stricta*, but it will not attack the other kinds. Thus we see how necessary it is, for the purposes of economic entomology, to critically distinguish between closely allied insects. The species of cochineal may possibly prove to be quite numerous, but at present we can distinguish the following:

(1) *Dactylopius coccus* Costa (*signoreti* Ckll.). The commercial cochineal.

(2) *Dactylopius opuntiae* (Lichtenstein in litt., Ckll.) is probably the more correct name for what is called *D. tomentosus* (Lamarck). We know exactly what it is, and in view of the now known diversity of types, it is probably impossible to say which Lamarck had or referred to.

(3) *Dactylopius confusus* (Ckll.), common in the Rocky Mountains of Colorado, and New Mexico, and in other southwestern states. The material from Ceylon, South Africa and Florida ascribed to *D. confusus* may not all pertain to this species.

(4) *Dactylopius greenii* n.n. (*Coccus confusus capensis* Green, 1912, not *Coccus capensis* L., 1766). Described from South Africa, but of American origin, and thus inappropriately called *capensis*. It occurs on *Opuntia monacantha*, and has been imported into Australia.

(5) *Dactylopius ceylonicus* (Green, 1896) (*indicus* Green, 1908). Also carried to Australia, and very effective against *O. monacantha*. The names applied to it are inappropriate, since the species originated in America, and is at home in Argentina. It has been very efficient against *O. monacantha* in India and Ceylon, but the related *O. dillenii* is practically immune. The name *ceylonicus* (*Coccus cacti* var. *ceylonicus*) was first published, and the brief description given prevents it from being a nomen nudum. Also, the name *Dactylopius indicus* is preoccupied.

(6) *Dactylopius newsteadi* (Ckll.), described from Arizona, and now carried to Australia. The locality, Colorado, given in the Fernald catalogue, is an error.

(7) *Dactylopius argentinus* Dominguez, 1907. Argentina, on *Opuntia ficus-indica* and *O. aurantiaca*. Whether this is valid, I do not know. *D. opuntiae* will not attack these species.

Another very interesting observation relates to the red-spider (really a mite) of the prickly pear, *Tetranychus opuntiae* Banks. This has been considered synonymous with the common greenhouse species, on morphological grounds, but its habits indicate otherwise. It is very efficient against *Opuntia inermis*, but can not be transferred to the plants infested by the common red-spider. Its operations induce the cactus to form a corky layer, analogous to gall-formation, and it is very remarkable that this process, once started, goes on, beyond the actual location of the mites, until it covers and smothers the joint. Mr. Dodd records (1927) that "although quite different in its mode of attack, the red spider is equally as important as the cochineal; together these two insects form a harmonious combine by which there is every reason to believe that the dense scrub areas of *O. inermis* will be eradicated." The prickly pear mite was described from Arizona, but the Australian material was obtained from Texas.

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## THE SMALLEST LIVING VERTEBRATE

UNQUESTIONABLY the smallest fish and the most diminutive of all vertebrates is a Philippine goby discovered by the writer and described in his volume entitled "Gobies of the Philippines and China Sea."

In 1902 Hugh M. Smith described a minute goby from Lake Buhi, Luzon, under the name of *Mistichthys luzonensis*. This species when full grown has an average length of 12.5 mm, males varying from slightly less than 10 to 13.5 mm in length; ripe females ranging from a little over 11 to 14 mm in length. This tiny fish, known as *sinarapan* in the Bikol language, occurs only in Lake Buhi, where it is exceedingly abundant and is caught in large numbers for food. It is easily the smallest commercial fish.

Tiny as *sinarapan* are, they are not nearly so small as a fish collected in the tidal creeks about Malabon, a town a few miles north of Manila. This species, which I named *Pandaka pygmaea*, is known from only seventy-five specimens. Adult males range from 7.5 to 9 mm in length, and females distended with eggs are from 10 to 11 mm long.

Compared to all other Lilliputian fish from various parts of the world both *Mistichthys luzonensis* and *Pandaka pygmaea* are very much smaller, even when not so very much shorter. They are both slender fishes and in life are colorless and so nearly transparent that only their large black eyes are visible. Conditions in the Philippines and especially in Luzon have produced an extraordinary variety of gobies,