the tip of the mandible is extreme, and when the mouth is opened and this wall is extended, the latter appears as a very thin and transparent membrane. When the mouth is shut, this wall is folded up like a curtain hidden between the mandible and the hyoid-bar. In Malacosteidae, the mandible is even larger than in other Stomatoids, the extensibility of the hyoid muscles still greater, and it seems possible that the part of the wall of the branchio-oral cavity between the rami of the mandible and the hyoid bars was perforated; and that thus a hyoid slit secondarily reappeared.

This is a suggestion only, and is not based on a study of the embryonic development of this slit, which has never been investigated in these fishes.

(2) *The mandibular operculum.* In Malacosteidae the mandible extends backwards much farther than usual in fishes, so that a large part of the belly, the chest with the pectoral fins, and the heart, are situated between the rami of the mandible. On the other hand, the 'isthmus' and the ventral parts of the hyoid and branchial arches extend much anteriorly and almost reach the symphysis of the mandible, while the dorsal parts of the branchial arches are short. Thus the branchial chambers have an unusually large ventral and anterior extension, and their greater part is situated between the anterior portion of the rami of the mandible. Consequently, the hyomandibular opercles are much reduced and their bony support is very weak; but on the ventral side, between the rami of the mandible, another opercular cover has appeared. This cover consists on each side of a fold along the ventral edge of the mandible extending backwards to the mandibulo-quadrate articulation, then turning round this articulation and passing upwards along the posterior edge of the quadrate to the point where the interhyal is attached to the suspensorium. This fold covers ventrally the space between the mandible and the isthmus. On the lateral side of the isthmus there is another fold extending from the pectoral fin to the anterior end of the isthmus. These two folds facing each other completely shut from beneath the ventral part of the branchial chamber.

The branchiostegal membrane in Malacosteidae is low and completely enclosed in the ventral part of the branchial chamber (when the rami of the mandible are not separated). The current of water entering through the hyoid slit reaches the gills freely; and thus this slit in Malacosteidae not only corresponds structurally to a hyoid gill-slit, but to a great extent probably also functions as a gill-slit. The folds along the edges of the mandible and the quadrate correspond to a mandibular operculum. It is not supported by bones.

It seems of some interest that two such 'Acanthodian' characters are found in fishes which do not differ in other respects from the 'true' teleosts.

The problems mentioned here will be dealt with fully elsewhere.
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Hermaphroditism in a Terrestrial Isopod

IN July last Dr. H. W. Howard forwarded to me a specimen of *Armadillidium vulgare* (Latreille) in which he pointed out that the styles were very small. On examination, this was confirmed, and I also noted that the oostegites had commenced to form. The specimen was carefully watched for eleven weeks, when it died; no further development had taken place. On examining the specimen internally, I found that the two ovaries were present, but only about half the size of those normally present. The two oviducts were quite normal. Moreover, on the animal's right side there was a duct, which opened on to the first appendage of the metasome, but no trace of testes. The anterior portion of this duct was slightly wider (vesicular semmalis) than the longer posterior half (vas deferens). Legrand¹ has described a case in this same species.

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¹ *C.R. Acad. Sci.*, 808 (1941).

South African Onychophora

DR. S. M. MANTON has directed attention¹ to two papers on South African Onychophora by Holliday in the *Annals of the Natal Museum*^{2,3}, and to the absence of references to published literature therein.

Mr. Holliday is a civil engineer without specialized knowledge of biology, and at my suggestion kept a number of *Peripatus* in captivity for the purpose of making a permanent photographic record of various incidents in the life-history of the animals which, so far as I was aware, had never been previously photographed. At the beginning of the study, Mr. Holliday knew nothing of the habits of *Peripatus* or of previous work which had been done on these animals; various notes and observations during the year and a half in which *Peripatopsis moseleyi* and *Opisthopatus cinctipes* were kept in his laboratory were set down in his own words and at my request arranged for publication as an accompaniment to the photographs. While the illustrations of Holliday's paper undoubtedly represent a new contribution to our knowledge of *Peripatus* in so far as the activities which they portray, such as feeding, moulting, and the birth of the young, have not been previously photographed, no claim is made that the papers bring forward facts not hitherto known in the life-history of this animal. Their usefulness lies rather in the confirmation of many known facts by an independent observer free from the inevitable bias of previous knowledge, and in the support lent to these facts by photographic evidence.

As Dr. Manton says, the facts described have long been known; it is also true, however, that observations on the life-history of South African Onychophora are still scanty and many of them require

further confirmation; a number of details still need to be filled in. The breeding period of *Peripatopsis moseleyi*, for example, is referred to very briefly by Manton in her papers⁴; the reference to it by Purcell⁵ is more detailed but consists of only a single observation. During two successive years, females of *Peripatopsis moseleyi* kept by Holliday at Pietermaritzburg gave birth only in March and April, no young being born during the intervening period; his observations are thus at variance with those of Manton, whose females at Cambridge produced young from June to September, and agree with those of Purcell, both with regard to the time of the year and the average number of young born.

Steel's observations⁶ show that in Australia the young of *Peripatus (Peripatoides) leuckarti* moult when between one and two weeks old; Holliday, on the other hand, found that the young of *Peripatopsis moseleyi* moulted a few minutes after birth.

Such discrepancies suggest that either the behaviour of *Peripatus* varies in different parts of the world, or that our knowledge of its life-history is as yet imperfect in many respects.

It is sincerely regretted if these two papers have given the impression that they claim to embody wholly new advances in our knowledge, or that they appear to ignore the work of previous authors, especially the outstanding contributions of Dr. Manton and her colleagues at Cambridge to the embryology, physiology and life-history of the South African Onychophora. The writer undertook his observations and contributed the notes as a lay observer, without knowledge of the more specialized investigations in the same field.

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¹ Manton, S. M., *Nature*, 156, 338 (1945).

² Holliday, R. A., *Ann. Natal Mus.*, 10, 237 (1942).

³ Holliday, R. A., *Ann. Natal Mus.*, 10, 433 (1944).

⁴ Manton, S. M., *Phil. Trans. Roy. Soc., B*, 228, 421 (1938). *Ann. Mag. Nat. Hist.*, 1, 515 (1938).

⁵ Purcell, W. F., *Ann. South Afr. Mus.*, 2, 67 (1900).

⁶ Steel, T., *Proc. Linn. Soc. N.S. Wales*, 21, 94 (1896).

Gliding in Bats

WHILE watching a greater horseshoe bat flying up and down a hedge at dusk, I noticed that the bat glided for short intervals very frequently throughout its flight. This behaviour has been described by many writers.

Bats of this sub-order (Microchiroptera) do not maintain a constant body temperature, but, in the absence of muscular activity, take up a temperature approximately equal to that of their surroundings; they cannot fly unless their body temperature is above a certain minimum which is normally reached (for example, when waking up) by progressively increasing muscular activity, and maintained by the activity of flight.

It therefore seemed unlikely that the gliding periods in flight could be of very long duration, as they would cause the body temperature to fall below the critical minimum for flight. In addition, it seemed that they might be impossible at lower air temperatures (the original observations were made on a warm July evening), or for smaller animals in which the rate of cooling would be greater because of the relatively higher surface area.

Observations were therefore made on successive evenings, when the air temperature was recorded, and an attempt was made to measure the duration of the gliding period. The latter was only done roughly, by a counting method, but it was possible on each occasion to make forty to fifty observations, and they were found to give good consistency. The results obtained were as follows:

Air temperature	Mean duration of glide
64° F.	4/5-1 sec.
60° F.	1/5-2/5 sec.
51° F.	Bat did not glide.

Further observations were not possible, but the few that were taken suggest that there may be a relationship between temperature and gliding time.

The question of bat size was not examined, but it was noticed that even on the warmest evening the pipistrelle bats (a considerably smaller species), which were plentiful in the same place, showed no signs of gliding.

It would be interesting to know whether any similar observations have been made, and whether, if in fact there is a temperature factor involved in gliding, the larger bats would habitually glide for as long as possible. It may be a habit of one species only, or it may be that all bats would glide if it were warm enough.

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Some 'Water Divining' in Algeria

NEARLY three years ago, *Nature* printed an article entitled "Geology, Geologists, and the War Effort"¹, which included some animal-diversions upon dowsing.

The idea of dowsing fascinates many people, and it is not surprising to find that from time to time it forms the subject of sensational articles in the popular Press. Even serious claims for the possibilities of the practice do not err on the side of modesty, as may be appreciated from two letters recently published². It is thus of importance to obtain objective data—hitherto scarce—as to the degree of precision attained by dowsers in their estimate of underground conditions at sites chosen by them for water wells.

In Algeria in 1943-44 I had opportunities of recording first some forecasts by three dowsers, two being French civilians (A and B), and one an enthusiastic British officer (C); and later the detailed