ducts are lateral (and caudal) of the Wolffian. Now it is obvious that if my observation holds for marsupials generally, no masculine uterus can arise, because between the two Mullerian ducts those of WOLFF are found. Eventual remnants of Mullerian ducts will have to be sought for in the male sex laterally of the terminal opening of the vasa deferentia. I have not yet been able to make observations of my own concerning this point.

As I have already stated, the ureters, at the stage I observed, lie at the medial side of the genital cords. Only those parts of the female genital apparatus of the marsupials which lie at the lateral side of the ureters, can, as I shall try to prove more fully elsewhere, have their homologa in the female genital system of the monodelphic mammals. The vaginal caecal sac developing phylogenetically in the marsupial group, has no homologon in the female sexual organ of the Monodelphia.

Finally, I think, my observation contains an explanation of the peculiar hook-shaped course of the terminals of the ureters of marsupials.

Either as a consequence of the spiral course of the Wolffian ducts, or for some other cause, the ureters at a certain stage of development lie medially of the Wolffian ducts (and of the genital cords) in a dorso-cranial direction towards the primitive kidney.

Marsupials possess a milk-nutrition (intestinal) at such an early stage of development as is known of no other mammal. This milk-nutrition will have a great influence on the development of the bladder which I found as a very voluminous organ in the marsupial young one described, as well as in other specimens (Didelphis) examined by me. With the rapid growth of the bladder the orifices of the ureters are at the same time displaced cranially. The above-mentioned cross-connection between the two genital cords is an obstacle to the cranial displacement of the ureters, the natural consequence of which is that the ureters have always to go round the caudal end of this bridge, while their orifices are further displaced cranially, the result of which is the pronounced hook-shaped course.

Zoology. — *"An interesting Case of Reversion."* By Dr. P. P. C. HOEK.

Pollicipes and *Scalpellum* are two nearly related genera of pedunculate Cirripedes mainly differing from one another, by the one having in its capitulum a restricted number of valves (*Scalpellum*) and by the other having a much larger number of such calcareous parts (*Pollicipes*).

DARWIN pointed out the resemblance of these two genera already in 1851[1]). That resemblance is greatest in those species of *Scalpellum* in which the carina is not bowed or angularly bent, but straight or nearly straight. DARWIN gave as an interesting case of such a species a description of *Sc. villosum* (fig. 2 of the accompanying plate). He was so struck by its general likeness to *Pollicipes*, that he wrote (l.c. p. 278): "*Sc. villosum* most closely resembles or rather is identical with *Pollicipes*. Had it not been for the fewness of the valves forming the capitulum, and from the presence of complemental males, I should have placed this species alongside of *Pollicipes spinosus* and *sertus*." And under *Pollicipes* (l.c. p. 294): "We have seen under *Scalpellum villosum* that the addition of a few small valves to the lower whorl, would convert it into a Pollicipes" etc. Compare fig. 3 of the accompanying plate.

The genus *Scalpellum* is represented under the deepsea animals by numerous species. Those of *Pollicipes* are shallow water forms only. The English "Challenger" Expedition collected during a four years' cruise over all the oceans of the world, specimens of 42 different species of *Scalpellum*, 41 of which were new to science. Only two of these were found in depths of less than 200 m.: all the others were true deep-sea species. H.M. "Siboga" collected in the Malay Archipelago, during a cruise of one year's duration, specimens of 38 different species of *Scalpellum*. Of these, 32 must be considered as new to science; 34 of these species are deepsea animals, 4 shallow-water forms.

The genus *Pollicipes* was not represented under the Cirripedia of the Challenger and by one species only under those of the Siboga: *Pollicipes mitella* a common littoral form of tropical seas. Whereas the number of known living species of *Scalpellum* was 6 in 1851 and is at least 125 at the present time (so far as I know [2])), of the genus *Pollicipes* which figures in DARWIN's book with 6 species also, only a seventh species has been described since the appearance of the said monograph. When DARWIN wrote that book the mysteries of the oceanic abysses were not unveiled to him of course, but his

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[1]) DARWIN, C., A Monograph on the Subclass Cirripedia. I. The Lepadidae or pedunculated Cirripedes. 1851.

[2]) Including the species collected by the Siboga. A. GRUVEL, who described the species collected by the French expeditions with the Travailleur and the Talisman, and C. AURIVILLIUS, who studied the Cirripedia of Swedish collections and published provisional descriptions of the Cirripedia collected by the Prince of Monaco during his numerous cruises have, with the present author contributed most to our knowledge of the species of this genus.

knowledge of the existing shallow-water forms of Cirripedia was fairly complete.

Returning to the interesting species *Sc. villosum*, the near affinity of which to *Pollicipes* was pointed out by DARWIN, I may mention first, that in my Report on the Cirripedia of the Challenger I was able to describe a species (*Sc. trispinosum*) belonging to the same division of the genus. It was collected in the Philippine Archipelago at a depth of 150 (perhaps 180 meters). Next, that the Siboga was successful in finding two more of them and that these will bear the names of *Sc. pollicipedoides* and *Sc. aries*. Though the capitulum of both species resembles the common form of *Scalpellum* (compare fig. 1) more than that of either *Sc. trispinosum* or *Sc. villosum*, the shape of the carina shows their affinity to the last named species at once.

These species were also taken in rather shallow water: in depths varying between 57 and 94 meters. The depth at which *Sc. villosum* lives is not so well known, but it cannot be important. DARWIN says that the specimens were found attached to shells and rocks: they were taken no doubt during shore-exploration.

So we can say that those species of *Scalpellum* which resemble *Pollicipes* most closely, like all known species of that genus itself, are inhabitants of shallow water. *Pollicipes* as is well known, embraces the oldest known Cirripeds and the genus *Scalpellum* is the second in age. The structure of *Sc. villosum* makes it highly probable that the genus *Scalpellum* descended from *Pollicipes*. This supposition finds very striking confirmation in a peculiarity of one of the specimens of *Sc. pollicipedoides*, which peculiarity I shall briefly describe here.

The said species is represented in the Siboga-collection by six specimens. It was found at Station 274 near the Jedan Islands, south of New Guinea, at a depth of 57 meter. Its capitulum has 15 valves: two scuta of triangular, two terga of rhomboid shape; a nearly straight carina, two rather small upper latera and eight valves of the lower whorl. Of these the rostrum and the subcarina have the umbo pointing transversely outwards; of the three pair of latera which, with rostrum and subcarina form the lower whorl, those of the middle pair are by far the smallest. The shape of all these valves is triangular with the umbo at the apex. Whereas the scutum and the tergum stand rather close together, the other valves are far apart, being separated from one another by chitinous membrane.

Though, as I pointed out above, the general shape of the capitulum

is more like a normal *Scalpellum*, in having one pair of latera more than *Sc. villosum* or *Sc. trispinosum*, *Sc. pollicipedoides* comes nearer to *Pollicipes* even than those species.

Looking over the six specimens of this new species, I was struck by finding that one of the specimens, though in other regards similar to the other five, differed from them by having in the lower whorl of valves two latera in addition to the three which all the specimens possess. In fig. 4 the left side of a normal, in fig. 5 the same side of the abnormal specimen is represented. (At the right side only one of the additional valves is developed.) In fact, the few small valves which according to DARWIN were wanting in the lower whorl of *Sc. villosum* to convert it into a *Pollicipes* occur in one of the specimens of this new species. By calling it a case of reversion I would indicate the high importance, which from an evolutionary point of view I attach to this abnormality. We need not go so far as to consider this species as representing exactly the "missing link" between the genera *Pollicipes* and *Scalpellum*, but I think the case shows clearly that a form with more numerous calcareous parts in its capitulum (like *Pollicipes*) is the older, the form with fewer (like *Scalpellum*) the younger one; moreover, that the *Scalpellum*-species with straight carinae, inhabitants of shallow water, must be considered as the oldest, i. e. the species most resembling the primitive form of *Scalpellum*.

(It is perhaps not quite superfluous to remark here, that 80 of the 125 species of *Scalpellum* have been studied and described by myself and I never saw before such an augmentation of valves in the lower whorl (or in the capitulum in general). Nor can I remember to have met with descriptions of such cases in literature. DARWIN for the classification of the genera of Cirripedia made use of the number, the shape and the mode of growth of the valves. That he was right in doing so is proved by the fact that later authors never put in doubt the value of these characteristics).

A full description of this and of the other new species of *Scalpellum* will be given in the forthcoming report on the Cirripedia of the Siboga-Expedition. I wish however to point out here, that *Sc. pollicipedoides* by the presence of a complemental male (Fig. 6) shows itself to be a true *Scalpellum* and that it has rudimentary caudal appendages which occur in *Pollicipes* also, but which curiously enough according to DARWIN are wanting in *Scalpellum villosum*.

EXPLANATION OF FIGURES.

Fig. 1. *Scalpellum rostratum*, Darwin. Seen from the right side.
„ 2. *Scalpellum villosum*, Leach. Seen from the right side.
„ 3. *Pollicipes sertus*, Darwin. Seen from the right side.
(Fig. 1—3 after Darwin, Monograph on the Cirripedia. Lepadidae. 1851).
„ 4. *Scalpellum pollicipedoides*, n. sp. Seen from the left side. Magnified 11 diameters.
„ 5. Same species, abnormal specimen. *a* the additional values. *b* the complemental male Magnified 11 diameters.
„ 6. The complemental male of *Sc. pollicipedoides*. Magnified 180 diameters.

Physics. — "*On the function* $\frac{a}{b}$ *for multiple mixtures.*" By Mr. B. M. VAN DALFSEN. (Communicated by Prof. J. D. VAN DER WAALS).

The quantities a and b appearing in this quotient are the constant quantities of the equation of condition of VAN DER WAALS, applied to a multiple mixture. The quantity $\frac{a}{b}$ then represents an expression proportional to the critical temperature of the undivided mixture. We imagine the mixture determined by the molecular fractions $x_1, x_2, \ldots, x_n$, where $x_1 + x_2 + \ldots + x_n = 1$ and all x's are positive quantities. Further we assume for a and b homogeneous quadratic functions of the x's, so that

$$a = \sum_{p=1}^{p=n} \sum_{q=1}^{q=n} a_{pq}\, x_p\, x_q$$

and

$$b = \sum_{p=1}^{p=n} \sum_{q=1}^{q=n} b_{pq}\, x_p\, x_q.$$ [1])

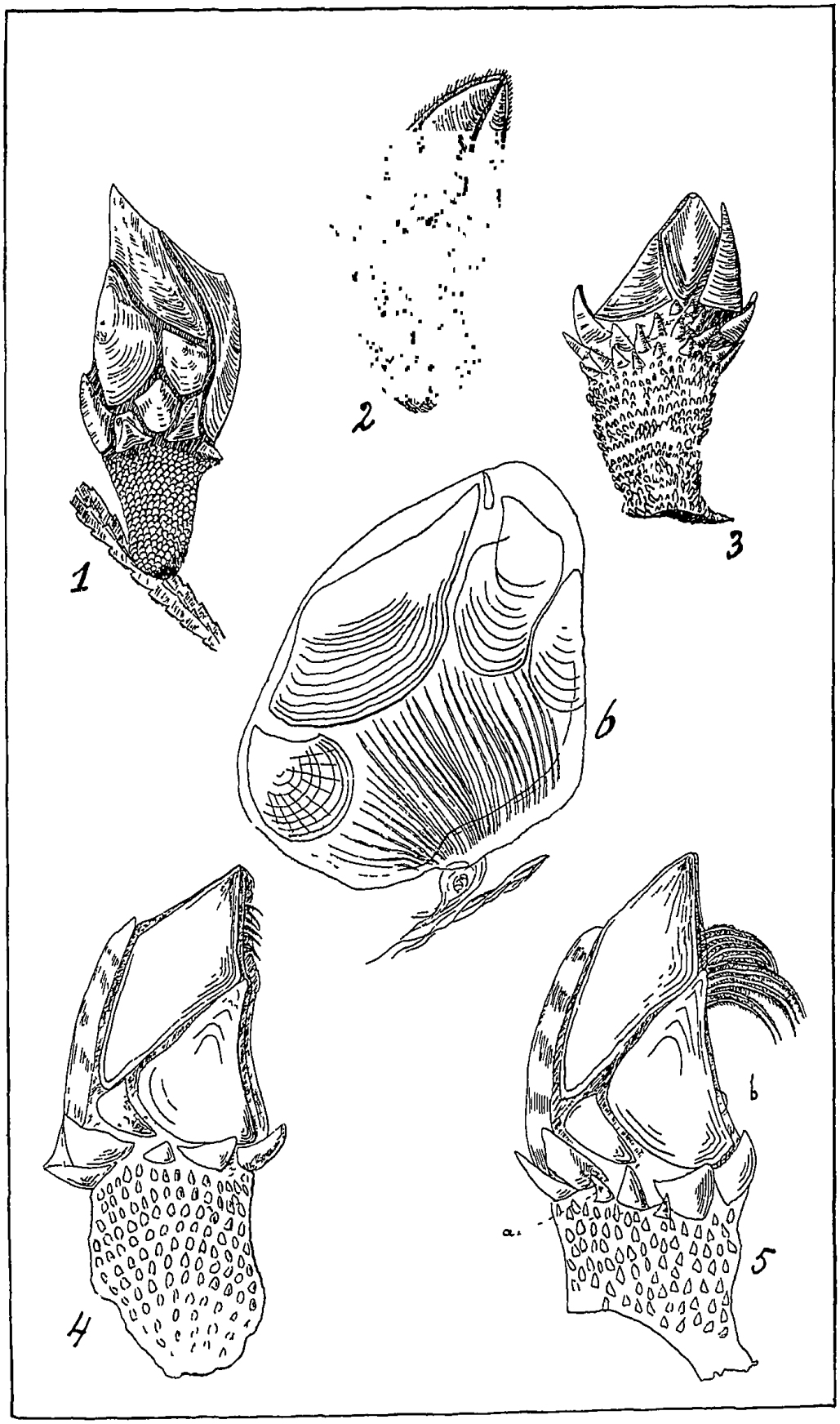
For the quantity a we must arrive, it is clear, at a quadratic function, as we have to do with attraction of the molecules two by two; for b we can suffice [2]) with a quadratic function as long as simultaneous collisions of more molecules are neglected.

Our particular business now is to find out whether there are mixtures for which $\frac{a}{b}$ is stationary.

The constitutions of those mixtures we find out of

[1]) Here $a_{pq} = a_{qp}$ and $b_{pq} = b_{qp}$. For a_{pp} and b_{pp} we put in the sequel ordinarily a_p and b_p.

[2]) Comp. H. A. LORENTZ, Wied. Ann. 12, p. 134.



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