industry as a whole; he looks at his balance sheet and there may be a loss to him.

Such manufacturers will only take women applicants when there are no suitable male applicants. Fortunately for professional women, that condition has already been reached in many branches of British industry. Women will be accepted because there is no other choice. Women should think carefully, however, before deciding on particular careers in industry. In such careers as general management, personnel management, and industrial medicine, a break for marriage and child-bearing should be no handicap and should enable the middle-aged women to return to industry even more fitted for her job. In rapidly evolving specialist fields, however, where knowledge of chemistry, physics and other natural sciences are involved, she may find it easy to secure a post before marriage but difficult to return to it afterwards.

Women who wish to find employment in industry may find this report disappointing; they should be consoled by the knowledge that industry can no longer do without them.

EARLY HISTORY OF THE SAUROPSID REPTILES

In palæontology, as in other branches of science, small things often lead to great and far-reaching results. It is not unexpected, therefore, that Prof. D. M. S. Watson, with his usual searching eye and his vast knowledge of reptilian structure, should develop some significant conclusions from his study of eight small reptilian skulls and associated skeletal materials, contained in a nodule of rock from the *Cisticephalus* zone of the Karroo series of South Africa. These fossil remains, representing the genus *Millerosaurus*, are described in detail in a recent paper* by Prof. Watson in which he turns to a discussion of the basic classification and the relationships of all the reptiles.

Millerosaurus, as Watson shows, is a small fossil reptile with a long body and slender limbs. The skull is basically cotylosaurian, but it has a well-developed lateral temporal fenestra, situated beneath the post-orbital and squamosal bones. A part of the skull roof is covered with bony osteoderms fused to the underlying skull bones, and at the back of the skull the quadrate is characterized by a long ascending process rising to the supratemporal bone. In the area behind these bones is a small stapes, quite comparable to the stapes of a lizard, which in life must have formed a communication between a large tympanic membrane and the fenestra ovalis. The pectoral girdle has a 'screw-shaped' glenoid, and in the hind foot the fifth digit is complete and divergent. The fifth metatarsal is straight—not a hook-shaped bone. Such are a few of the bare facts concerning the osteology of *Millerosaurus*. What are the implications?

In 1916 Goodrich saw a basic dichotomy within all but the most primitive reptiles, the two branches of which he designated the Sauropsida and the Theropsida. Watson upholds this view of reptilian evolution, and he places *Millerosaurus* and its relatives as very important ancestors of sauropsids. In line with previous work, he believes the ear region to be of particular diagnostic value in the determination of sauropsid and theropsid relationships. Thus *Millerosaurus* is an ancestral sauropsid, in part because it has the type of ear structure briefly described above. (In the theropsids, according to Watson, the tympanic membrane was lost for some time during late Palæozoic times, and in later forms was re-established as a neomorphic structure, not homologous with the tympanic membrane of the sauropsids. This part of his thesis is disputed by some authorities, notably Vaughan in a recent contribution.)

Because of the important situation of the millerosaurs (as *Millerosaurus* and its near relatives may be designated) in time and in their taxonomic position, this study throws light on many other reptiles and on the whole subject of reptilian classification. Watson believes that the temporal fenestræ are of secondary importance in determining reptilian relationships. He suggests that the millerosaurs, which are essentially cotylosaurs with lateral temporal fenestræ, might well have been ancestral to the prolacertilian reptiles, to the eosuchians and to the great thecodont–archosaur complex; in short, to sauropsids, which comprise the great majority of reptiles through time. He believes that the evolution of the diadectids may represent an entirely separate reptilian development, parallel to the rise of the procolophonid–millerosaur stem, the true base for the sauropsids.

Watson's conclusions are of broad consequence to students of reptilian evolution, and the accumulating mass of evidence would seem to reinforce these ideas. Since the concept of an early dichotomy of evolving reptiles is of such significance to future work in this field it is perhaps unfortunate that Goodrich's term 'Theropsida' is being continued. This word might well be abandoned in favour of some other name that is less apt to get confused in many minds, and particularly in many typewriters and printing presses, with the long-established taxonomic designation 'Therapsida'. Indeed, though not so serious a case, the term Sauropsida bears too strong a resemblance to Sauropoda for complete comfort. Could we not have two new names for the two primary lines of reptilian evolution?

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* *Phil. Trans. Roy. Soc.*, B, No. 673, **240**, 325 (1957): On *Millerosaurus* and the Early History of the Sauropsid Reptiles. By Prof. D. M. S. Watson. (London: Royal Society, 1957.) 25*s*.

FILTER FEEDING IN FLAMINGOES

Filter feeding is very rare among the higher vertebrates—among the mammals it occurs only in the whalebone whales, and among the birds in the Anatidae and in some species of a few other families. It reaches its highest development in the flamingoes, in which it has been investigated by Miss Penelope M. Jenkin, who reports her results in a recent memoir*.

There are six species of flamingo according to some authorities, or four, one of which is divided into three sub-species, according to others; they are partitioned between three genera. Flamingoes are widely distributed throughout the warmer regions of both Old and New Worlds, and their distribution is determined by the situation of the salt or alkaline lakes where their food occurs in abundance. They thus congregate near the great deserts of the world, often at high altitudes. When Miss Jenkin was working on the

* *Phil. Trans. Roy. Soc.*, B, No. 674, **240**, 401 (1957): The Filter Feeding and Food of Flamingoes (Phoenicopteri). By Penelope M. Jenkin. (London, Royal Society, 1957.) 35*s*. 6*d*.

ecology of alkaline lakes during the Percy Sladen Expedition to the Rift Valley Lakes in Kenya she was able to watch two species of flamingo feeding, and established that one of them, *Phoeniconaias minor*, feeds exclusively on minute blue-green algae and diatoms. An extremely fine filter is necessary to separate such minute organisms from the water, and further examination showed that the mesh of the filter mechanism in this species is of the order of only 0·01 mm. across. In the other species, *Phoenicopterus antiquorum*, the filter is much coarser with a mesh of about 0·5 mm. × 1·0 mm., and the food consists of such comparatively large organisms as chironomid larvæ, small molluscs and crustaceans and seeds of lacustrine plants. The two species can therefore feed in the same lake without competing for food.

A transverse section of the bill of a flamingo shows a median ridge in the roof of the mouth that causes the palate to be V-shaped in section, with each limb of the V opposing the corresponding inner surface of the mandible. In some species, the "shallow keeled" forms, the angle of the V is obtuse; in others, the "deep keeled" forms, it is acute and the opposing surfaces are comparatively much larger. Beneath the apex of the V the tongue, more or less circular in section, fills a corresponding groove between the rami of the mandible. Two rows of recurved hooks on its dorsal surface fit into the spaces on each side between maxilla and mandible. The opposing surfaces of the jaws are beset with rows of lamellæ broken up into small platelets, which in some species have fringed edges so that they show a remarkable resemblance to the baleen of whalebone whales on a minute scale. At the margins of the jaws there is a series of much larger lamellæ or hooks, "the excluders", each corresponding to several rows of the finer lamellæ.

All species of flamingo wade or swim in the water and depress the head into such a position that the upper surface of the upper jaw is directed downwards, a posture which is facilitated by the downward curvature of the distal part of the bill. The head is swept from side to side in wide curves either at the surface or below it according to the species and the type of food sought. At the same time the fleshy tongue is moved to and fro in its groove like a piston so that water is pumped in and out of the mouth. On the suction stroke the jaws are slightly separated to break the filter and allow particles of a size that can pass the excluders to enter the mouth with the water. On the exhaust stroke the jaws are approximated so that the particles are retained on the filter as the water is expelled through it. On the following suction stroke the particles are removed from the filter and passed backwards towards the œsophagus by the recurved spines on the surface of the tongue. The movement of the bill produces an action analogous to that of woolcarders, so that the enmeshed particles are gathered together and presented to the hooks on the tongue.

Flamingoes are not, as has been claimed, monophagous. They eat any organisms that pass the excluders and are retained by the filters, and if the diet is limited to one species that is an ecological accident. When as a result of 'over fishing' or of climatic factors all the organisms that can be collected have disappeared, the flamingoes move to new feeding grounds—they are notoriously erratic in their appearances and breeding sites. But if the normal food supply runs short when they cannot depart because they are tied to a particular area where they are nesting they resort to feeding upon mud, and obtain their nourishment from the organic matter, diatoms and debris, included in it.

Miss Jenkins emphasizes the importance of filter feeding to flamingoes feeding in lakes where the waters differ osmotically and in ionic balance from the body fluids of the birds. By concentrating the food organisms a minimum of the physiologically unsuitable medium is ingested, with a consequent easing of the burden placed upon the kidneys. Filter feeding, in addition to its use in obtaining nourishment, appears to have an equally important function in preventing excess salts from passing beyond the bill into the alimentary canal. In support of this conclusion the author adduces the well-known fact that flamingoes periodically leave their feeding grounds to drink at fresh-water sources.

Finally, Miss Jenkin discusses the affinities and evolution of the flamingoes, and concludes that they are descended from early anseriiform ancestors and that they occupy an intermediate position between the Anseriiformes and the Ciconiiformes.

The author is to be congratulated upon a most interesting and important series of researches which have occupied her attention for a considerable time. As ever in original investigation, her results, while recording numerous hitherto unknown facts, raise a considerable number of new problems which, it is to be hoped, she or her pupils will have the opportunity of resolving.

L. HARRISON MATTHEWS

THE SITE OF THE NEUROHYPOPHYSIAL OSMORECEPTORS

THROUGH the classical work of Verney in the 1940's, presented so elegantly in his Croonian lecture (*Proc. Roy. Soc.*, B, **135**, 25; 1947), a physiological mechanism was elucidated by which the organism is able to regulate its water loss with the urine. A series of elegant experiments accomplished under fully physiological conditions in the dog led Verney to the conception of osmoreceptors situated in the brain, within the distribution area of the internal carotid artery. These receptors, when activated by a normal or raised osmotic pressure of the blood, send impulses to the neurohypophysis to release the antidiuretic hormone.

Recently, P. A. Jewell and Prof. E. B. Verney, in an extensive paper*, have summarized ten years continued work in this field. In a long series of laborious experiments, performed with the utmost carefulness, skill and inventiveness, they have been able to show that neurohypophysial osmoreceptors are localized within the anterior hypothalamus and, perhaps, also within adjacent parts of the pre-optic area. What makes this work so valuable and decisive is the fact that here as in Verney's earlier experiments they have exclusively used blood-borne, physiological stimuli on unanæsthetized animals.

It is not possible to do justice to this work within the limits of a short review, but some of the main points may be mentioned.

To trace the arterial blood, which in the different experiments had carried the osmotic stimuli, it was first necessary to make a careful anatomical study of

* *Phil. Trans. Roy. Soc.*, B, No. 672, **240**, 197 (1957): An Experimental Attempt to Determine the Site of the Neurohypophysial Osmoreceptors in the Dog. By P. A. Jewell and Prof. E. B. Verney. (London: Royal Society, 1957.) 52*s.* 6*d.*