breast cancer being found in 21 of these. For the controls, cancer occurred in a total of 80 families, with an incidence of breast cancer in 13.

There is a notable absence of any significant infant mortality rate due to cancer, attributable probably to poor diagnosis in earlier times. Mortality in the early age-groups, particularly in the 0–4 years age-group, is high, but, of 819 deaths of relations for both cancer and control groups, only one death from cancer is reported. This was reflected in a general reduction in the incidence of all cancers in both groups.

The mean age for detection of cancer of the breast in the proband is 47·5 years, and for those families with breast cancer in relatives it is 48·4 years. The mean ages for patients and control groups at the time of the survey were 50·1 ± 13·6 years (cancer group) and 50·4 ± 10·3 years (control group). This means that the cancer group has, on the average, lived 2·6 years since the diagnosis of their disease.

The number of cases of cancer and the types of cancer occurring in the two groups show a similar distribution, except for breast cancer. The highest rate for breast cancer among relatives occurs in maternal aunts. There is a higher incidence of breast cancers and all cancers in female relations of breast cancer patients. With regard to the effect of degree of relationship, there is a high incidence of breast cancer in persons with a coefficient of relationship of one-quarter in the patient group.

EPILEPSY IN AFRICANS

A STUDY of epilepsy in Africans in Southern Rhodesia has been undertaken by Dr. L. F. Levy, Dr. J. I. Forbes and Dr. T. S. Parirenyatwa of Harare Hospital, Salisbury, Southern Rhodesia (*Central African Journal of Medicine*, **10**, No. 7; July, 1964). In a field survey carried out in the Semokwe Reserve, 130 persons admitting to seizures were discovered in a population of approximately 17,500, and these sufferers were interviewed. A parallel group of 100 patients presenting at Harare Hospital with the complaint of seizures was also fully investigated.

The incidence of epilepsy in Africans is probably slightly higher than in Europeans, but African patients tend to present themselves for treatment only when their earning capacity becomes threatened by the disorder. Fits affecting women and children seem to be regarded by patient and parent alike as a misfortune to be accepted, and there must be large numbers of rural sufferers who have never sought medical help. Even allowing for this tolerance of fits, however, the discrepancy between the number of males (161) and females (69) in the combined study seems remarkable and contrasts strongly with the sex distribution reported by other authors.

The age of onset of the disease is similar to that found in other racial groups. Premonitory symptoms vary widely and have no special characteristics. The frequency of attacks in the rural group is interesting because it reflects the pattern of epilepsy which is uncontrolled and allowed to run its natural course. About 10 per cent of the sufferers in the Semokwe Reserve group had fits once a day or more; another 10 per cent had fits several times a month; more than half (56 per cent) had fits once or twice a month, and the remaining 24 per cent had them at intervals of once in two months or longer. A family history of fits was obtained from 65 per cent of the sufferers in the Semokwe Reserve group, but only from 20 per cent of those in the Harare Hospital group. The question of genetic factors in epilepsy should be re-evaluated in all races.

Accidents resulting from fits are common. Twenty-one per cent of the field group and 19 per cent of the hospital group had sustained burns at some time, and, in many cases, the deformity resulting from these was severe. Apart from the physical trauma, epilepsy has a marked effect on the life of the sufferer. In the Semokwe Reserve group 39 per cent of the children up to the age of 14 years were made the butt of humour, and 44 per cent of patients over the age of 15 years were made to feel outcasts by the rest of the community. Twelve male adults and one female had been dismissed from their jobs on account of their seizures. The effects of epilepsy on marital life seem to have no special peculiarities.

Enquiries into tribal beliefs about the ætiology of epilepsy reveal how widespread is superstition and to what extent belief in witchcraft persists. Fifty-nine per cent of Semokwe Reserve sufferers believed their epilepsy resulted from their being 'bewitched'.

The present treatment of epilepsy in such patients is frequently unsatisfactory. The standard anti-convulsant drugs are as effective in controlling their fits as in other races, but, in the first place, sufferers do not make themselves available for treatment; and, secondly, even if they do, the problem of achieving regular and conscientious administration of the selected drug remains. This was also the finding of Hurst *et al.* in the Meadowlands survey. Education and enlightenment of rural Africans will, no doubt, eventually change their present attitude of resignation. In the meantime, it seems that the only way to reach the sufferers would be to send mobile teams into the reserves to seek them out. Once the diagnosis has been made and curable underlying disease excluded, treatment with a long-acting injectionable anti-convulsant would appear to offer the best hope of adequate control.

RECENT REVIEWS OF FOSSIL FISHES

TWO publications of special interest have recently been published on fossil fish: Dr. R. H. Denison has reviewed the Cyathaspididae *, and Dr. C. Patterson † the Mesozoic Acanthopterygia.

Dr. Denison deals with the earliest known family of Agnatha, excluding isolated fragments from earlier strata. The material ranges from the base of the Middle Silurian (Wenlockian) to late Early Devonian (Dittonian). The author describes the anatomy, external and internal, of all forms, which comprise in his interpretation 63 species grouped into 19 genera. The classification adopted for the Cyathaspididae is essentially that of other recent writers, allowing for shifts in the hierarchical status of the taxa. Dr. Denison follows most scholars, Stensiö excepted, in dissociating the Heterostraci from close affinity with the cyclostomes, osteostraci and anaspids. He divides the class Agnatha into two sub-classes, the more primitive Diplorhina with Heterostraci and probably Coelolepida, and the more specialized Monorhina with Myxinoidea and

* Chicago Natural History Museum. *Fieldiana: Geology*. **13**, No. 5: *The Cyathaspididae—a Family of Silurian and Devonian Jawless Vertebrates*. By Robert H. Denison. Pp. 309–473. (Chicago: Chicago Natural History Museum, 1964.) 5 dollars.

† *Philosophical Transactions of the Royal Society of London*. Series B: Biological Sciences. No. 739, **247** (July 2, 1964): *A Review of Mesozoic Acanthopterygian Fishes, with special reference to those of the English Chalk*. By C. Patterson. Pp. 212–482 + plates 2–5. (London: Royal Society, 1964.) 105*s*. 15.75 dollars.

with Petromyzonoidea, Osteostraci and Anaspida. All genera in the family are revised, with emphasis on the North American forms and *curricula vitae* given for all species, often with illustrations. In the latter part of his paper, Dr. Denison discusses the habitat, adaptation, evolution, growth and phylogeny of the family. He concludes that they were marine, not highly specialized for benthonic life but well adapted to moving in turbid and poorly lighted waters. He suggests that they were essentially bottom feeders, feeding in a manner similar to that described by Parrington[1] in 1958 for the anaspids. The primitive condition in the cyathaspids is considered to be a shield formed from the fusion of numerous small scales or tesseræ, with the development of large plates in later forms—a view which is consistent with the derivation of the Pteraspididae from the Cyathaspididae.

A review of Mesozoic fishes is long overdue, and Dr. Patterson's study admirably fills the hiatus. While little new material has been added to collections since Smith Woodward[2] produced his monograph on the acanthopterygians, Dr. Patterson has had the inestimable advantage of acid preparations for many of the specimens. Species are now known with a detail and precision impossible half a century ago. The emphasis in the work is on morphology rather than on systematics, and hence isolated scales, teeth and otoliths are omitted, the latter perhaps to be regretted on account of its stratigraphic potential. Dr. Patterson's lengthy review falls into three parts; the first deals with acanthopterygians and ctenothrissiforms of the English Chalk, their systematics and anatomy being discussed in detail; in the second part acanthopterygian faunas of all other Mesozoic deposits are briefly discussed and compared with the British fauna; in the third part the author discusses the morphological, systematic and evolutionary problems arising from his study.

The systematics and morphology of Parts 1 and 2 form the bulk of the work; careful and detailed anatomical descriptions are given accompanied by clear and well-labelled text-figures. The interpretations and deductions are collected into Part 3, which will be read by many not directly concerned with specific details. Dr. Patterson proposes a sub-division of the Beryciformes into three sub-orders; the distinctions are not clear cut and it is doubtful that this truly reflects phylogeny. The author discusses the evolution of the acanthopterygian upper jaw, the origin of the fin spines and the trigemino-facialis chamber. Examining the time span of the Beryciformes, the Cenomanian is seen to contain 19 species in 10 genera, while the Senonian has 22 species in 8 genera. These figures do not reflect the popular picture of rapid radiation of the group during the Mesozoic; they point rather to a pre-Cenomanian deployment, Patterson suggests from Ctenothrissiform stocks, with maintenance of diversity until Senonian times when the Beryciformes are largely replaced by the Perciformes.

In the evolution of the acanthopterygians, three functional trends are defined; increasing manœuvrability, reduction in the buccal dentition accompanied by increase in the pharyngeal dentition, and development of defence mechanisms. Dr. Patterson supports the concept of polyphyletic origin for the Beryciformes and implies the same for the Perciformes. Transitional forms link the two orders and the adaptive advantages of the changes involved—presence or absence of orbitosphenoid, number of pelvic and caudal fin rays—are not apparent. This treatise does not supply answers to all questions on acanthopterygian history; it presents that history clearly and authoritatively, thus enabling us to frame our questions more precisely.

R. J. G. SAVAGE

[1] Parrington, in Westoll, T. S., *Studies in Fossil Vertebrates* (Athlone Press, University of London, 1958).

[2] Woodward, A. Smith, *Mon. Palaeont. Soc., London*, 1902–1912.

EARLY RECEPTOR POTENTIAL OF THE VERTEBRATE RETINA

A NEW receptor potential of the monkey retina has been reported recently by Brown and Murakami[1]. They observed this new response using an intra-retinal microelectrode and intense stimulus flashes. The latency of the response is very short (less than 0·1 msec), and the amplitude of the response is largest when the tip of the electrode is at the level of the ciliary connexion between the outer and inner segments of the receptors. Brown and Murakami's conclusion that this new response is generated by the receptors is of great significance for visual research; but some additional evidence is still needed to make the support for their conclusion fully convincing. For example, they observed this response in the cone retina of the cynomolgus monkey but could not observe it in the rod retinæ of the night monkey and cat. No attempt was made to directly identify the pigment on which this response depends.

In this communication I wish to report that a quite similar response occurs in the electroretinogram (ERG), and that this ERG response has been observed in every vertebrate eye so far investigated. Furthermore, several lines of evidence given here show that in the all-rod eye of the albino rat this response almost certainly depends on the visual pigment contained in the rod outer segments. Therefore, because the latency of the response is so short, this evidence provides strong and independent support for Brown and Murakami's conclusion that this new response is a receptor potential. Moreover, the amplitude of this new response is linearly proportional to the amount of pigment bleached by the stimulus flash. Thus this new response appears to be more closely linked to initial photochemical events than any other electrical response so far recorded in vertebrate eyes.

In the work recorded here, stimulus flashes were produced by a 65-W-sec photographic strobe lamp (Honewell Strobonar 65*C*) which had a flash duration shorter than 0·7 msec. To minimize electrical and photovoltaic artefacts, the strobe lamp was enclosed in a soft-steel box, and the electrodes, which consisted of saline-soaked cotton wicks leading to Ag-AgCl wires, were partially shielded from the light. With this arrangement, the amplitude of the stimulus artefact was less than 5 μV during the time-interval of interest. A series of simple lenses focused the light from the lamp on to the cornea, forming a roughly 110° Maxwellian view, and the flash energy was adjusted by interposing Wratten neutral density filters. In the rat, the effective flash energy was determined by observing the amplitude of the dark-adapted *b*-wave as a function of flash energy. The resulting curve of amplitude versus energy could then be compared with a calibrated curve previously described[2]. The effective flash energies are, therefore, given in terms of the number of quanta absorbed by the average rod per flash. This energy scale will be abbreviated to read 'quanta/rod'.

Oscilloscope traces of the ERG which exhibit the early response are shown in Fig. 1. Fig. 1*A* shows the ERG of a dark-adapted albino rat (Sprague–Dawley) for a flash with an effective energy of about $1 \cdot 5 \times 10^6$ quanta/rod. There are about 3×10^7 rhodopsin molecules/rod in the rat eye[2], so this flash bleached about 3–5 per cent of the visual pigment. The well-known *a*- and *b*-waves of the ERG are labelled in Fig. 1; at such high energies they have a somewhat unusual appearance. The new response can be seen at the start of the trace. The peak of this response occurs about 1 msec after the start of the flash, and most of the response is over before the *a*-wave begins to appear.