after the wound had been inflicted in order to obtain the greatest benefit. Fifty-six papers were presented to this Section, many of which will appear in scientific journals. Space permits the mention of the two invited papers only. That by Dr. Babkin, on "Secretory Mechanism of the Digestive Glands", contained a survey of the work of his laboratory on this subject. Briefly, it may be stated that the investigations have established that the mucous, demilune and myo-epithelial cell groups of the submaxillary gland each have a separate innervation, and that the surface epithelium cells of the gastric mucosa and the mucoid, peptic and parietal cells of the gastric glands are under independent nervous or humoral control. The conclusions to be derived from this work were stated and further analysis of the secretory function of the digestive glands given. The second paper, by Prof. G. W. Scarth on "The Mechanism of Frost Resistance", contained an account of the modes of frost injury to plant cells and of the protoplasmic changes which accompany frost-hardening. He also discussed how the different hardening changes afford protection. The new president of this Section is Prof. H. S. Jackson.

At the general meeting, Monsignor Olivier Maurault, rector of the University of Montreal and a fellow of Section I, was elected president of the Society, and Prof. J. K. Robertson was elected vice-president.

DAVID A. KEYS.

HERMIT CRABS FROM THE JOHN MURRAY EXPEDITION

DR. E. F. THOMPSON has published some interesting facts in the report referred to below* of collections obtained by the John Murray Expedition. The stations at which the Pagurids were taken are confined to the Gulf of Oman, the south Arabian coast, the Gulf of Aden, the East African coast, the Zanzibar region and the Maldive area, that is to say to the coastal regions and the two Gulfs.

The littoral and shallow-water forms are related to those of the rest of the Indo-Pacific region. The deep-water forms may be divided into those living at mid-depths, which have considerable affinity with those of the North Atlantic, and the only truly abyssal form *Parapagurus pilosimanus*, which occurs at great depths around the edges of every ocean basin in the world. Nothing is known of the life-history of this species. It has always been recorded as housed in a typical zoophyte growth. In the present collection this was not the case; a number of different shells were used, the most frequent being Ianthina. The zoophyte house begins around a shell, and the author has found in two specimens examined from the North Atlantic that this basis was also on Ianthina.

Paguropsis typica, hitherto only known from the Philippines, the Gulf of Martaban and Cape Comorin, was found in the Zanzibar region, thus extending its known distribution another 2,000 miles round the world. Its range in depth is only 32 metres, although its geographical distribution is so wide.

The one new species described is a Sympagurus, *S. burkenroadi*. The suggestion that the three specimens of Glaucothoe, attributed to *G. hendersoni*, found in the collection may be the larvæ of *S. burkenroadi* is most interesting. Whether the large symmetrical deep-water pagurids known as Glaucothoe are adults or larvæ is now practically settled in favour of the latter view, but it is still a matter of controversy as to whether they are abnormal or normal larval forms—the larvæ of small pagurids which have failed to find a shell and consequently have continued to grow in a larval state, or merely natural larvæ of large forms. The latter solution appears most likely to be the correct one, and Dr. Thompson has brought the matter further by finding these Glaucothoes inhabiting shells, with the abdomen twisted, but still with paired abdominal appendages and a symmetrical tail fan. Thus they are further developed towards adult pagurids than any specimen previously recorded. If they are normal larvæ, they must belong to large adults. In the present case the adult is very probably a Sympagurus, and the characters, except for those which are purely larval, agree very closely with those of *S. burkenroadi*. Moreover, one was found inhabiting the same species of shell. We are certainly well on the way to solving the 'Glaucothoe problem'.

* Paguridæ and Cœnobitidæ. By Dr. E. F. Thompson. (The John Murray Expedition 1933–34, Scientific Reports, 7, No. 5, 1943.) (London: British Museum (Natural History).)

HIGH CRYSTAL HARMONICS FOR OSCILLATOR CONTROL

AN article on this subject by I.E. Fair (*Bell Lab. Rec.*, 21, No. 8; April, 1943) points out that stability is one of the major requirements for oscillators controlling the frequency of radio transmitters. In ultra-high-frequency transmitters it assumes particular importance because a very small percentage change in the frequency of the controlling oscillator may shift the transmitted band many thousands of cycles. At 100 mc., for example, a 0·01 per cent change in frequency means a change of 10 kc., which is as much as the entire width of a broadcast band. Stability in oscillators is secured by some form of tuned circuit. The reactance of such a circuit changes slowly with frequency except over a narrow band in the region of resonance, where a small change in frequency is accompanied by a very large change in reactance, this latter enabling the resonant circuit to act as a frequency stabilizing element. Quartz crystals are eminently suited to control in this way because of their very sharp resonance, which is due to their low values of coupling and dissipation. Their characteristics change only slightly with variations in temperature and voltage, and thus high stability under all conditions is more easily obtained with them than with elements having higher dissipation or greater sensitiveness and voltage.

With the type of crystal most commonly used for oscillators, the frequency of resonance is inversely proportional to the thickness of the crystal. At 10 mc., for example, the thickness of the crystal is only about 6½ thousandths of an inch. Before being used in an oscillator, the crystal must be ground accurately to have parallel faces and to the desired thickness; satisfactory grinding becomes impracticable for crystals appreciably thinner than this. For transmitters requiring higher frequencies it has been almost universal practice to use a crystal with its fundamental resonance below 10 mc. and to employ a harmonic generator to secure the desired high frequency. So far as stability is concerned, this method is satisfactory, but it requires a very appre-