

London) presented evidence obtained from experiments in guinea-pigs and sheep which demonstrated the action of the placenta on the myometrium, and indicated its possible function in labour. Dr. Jung (Universität Frauenklinik, Germany) demonstrated a substance of myometrial origin which activated the rat uterus, while inhibiting the human uterus.

Prof. Robson and Dr. Robinson (Guy's Hospital Medical School, London) presented evidence for the presence of an anti-inflammatory substance at sites of inflammation, with some preliminary data on its possible chemical nature. Dr. Masek (Institute of Pharmacology, Prague) described the pharmacological effects of palmitoyl ethanamide, a compound which occurs naturally in some mammalian tissues, and which has been shown to possess anti-inflammatory, anti-anaphylactic, and analgesic actions.

Several papers dealt with various aspects of assay techniques used to estimate trophic factors associated with central control of endocrine function. Dr. De Wied (University of Utrecht, The Netherlands) reviewed the *in vivo* and *in vitro* methods available for the assay of corticotrophin releasing factor. Prof. Martini (University of Milan, Italy) then discussed a new technique known as the "pituitary depletion method", which has recently been developed in his department. This enables simultaneous evaluation of the activity of hypothalamic extracts on all pituitary hormones, and has facilitated investigation of the physiological significance of the hypothalamic control factors. Finally, in this sphere, advances in the techniques of extraction, separation and purification of human follicle stimulating hormone were reviewed by Dr. Reichert (Emory University, U.S.A.), who then went on to discuss the value of available biological assay methods. The preparation of purer samples of follicle stimulating hormone has, over recent years, made possible much greater accuracy in therapeutic dosage in cases of amenorrhoea, thus reducing the risk of multiple ovulation.

B. V. ROBINSON
J. M. ROBSON

constant beamwidth over a wide range of transmitted frequencies. These possibilities could completely revolutionize the design of echo-sounders, wide band sonars and transmit-beam scanning sonars. A small scale model of a non-linear sonar system was also demonstrated; a narrow beam of acoustic waves at a frequency of 100 Kc/s was formed from two primary waves in the region of 3 Mc/s. Professor Tjøtta made the further point that if one of the primary waves was used as a "pump" and the other consisted of an echo-signal from a distant target, parametric amplification of the weaker signal could be effected. During the discussion, the similarity between the parametric amplification of acoustic and electronic travelling waves was noted, particularly in regard to the need to suppress the sum frequency wave.

Mr. R. T. Smith (Imperial College of Science and Technology) showed that an initially sinusoidal wave of high amplitude becomes progressively more triangular owing to changes in the velocity of propagation of various parts of the wave. He also discussed the formation of shock waves in liquids and related this to the physical properties of the medium.

In the final paper Dr. V. G. Welsby and Mr. M. H. Safar of the University of Birmingham described investigations of the generation of harmonic and subharmonic frequencies when the amplitude of a single primary wave is increased to the region of the cavitation threshold of the medium. As the acoustic pressure is increased, the subharmonic level increases; but sometimes on approaching the cavitation threshold the subharmonic decreases slightly and then, after cavitation, rapidly increases. (On other occasions the dip near cavitation is less pronounced or even entirely absent; the factors governing its appearance have not yet been fully investigated.) On the basis of their experiments the authors posed a number of questions about the physical mechanisms involved, and discussion made it clear that there is considerable uncertainty on this topic.

The British Acoustical Society seems to have got off to a good start with a successful first meeting.

B. K. GAZEY

NON-LINEAR ACOUSTICS

SIXTY-TWO people attended the one-day symposium on non-linear underwater acoustics, sponsored by the newly formed British Acoustical Society and organized on its behalf by Professor D. G. Tucker, which was held in the Department of Electronic and Electrical Engineering at the University of Birmingham on July 19. Professor Tucker took the chair for the morning session and Dr. R. W. B. Stephens (Imperial College of Science and Technology) in the afternoon.

Three of the five papers presented discussed the sound field arising from the interaction of two coincident acoustic waves. Professor S. Tjøtta (University of Bergen) presented a rigorous mathematical analysis based on the hydrodynamical equations while Dr. H. O. Berktaay and Mr. B. V. Smith (University of Birmingham) gave alternative (and simplified) engineering approaches to the same problem. These papers showed that, as a result of the non-linear relationships of acoustic pressure with density on one hand and compressibility on the other, two coincident plane (or spherical) primary waves of differing frequencies produce virtual sources in the water at the harmonic and intermodulation frequencies. These virtual sources form a virtual acoustic array in the medium itself, and Dr. Berktaay discussed in detail some possible transmitting applications of the virtual array formed at the difference frequency and illustrated these by experiments. He showed that a number of desirable results could be obtained economically, including high directivity at low frequencies with small transducers and a substantially

OBITUARIES

S. E. Hollingworth

THE sudden death in London on June 23, 1966, of Professor Sydney Ewart Hollingworth, on the eve of retirement after 20 years in the Yates-Goldsmid chair of Geology at University College, London, was a shock to his many friends. He was the twelfth well-known British geologist to die since March, 1965. Before becoming professor he had served 25 years with the Geological Survey of Great Britain where he had established a high reputation as a field geologist with an independent and critical outlook.

He was born on November 7, 1899, and educated at Northampton School. After a short period of Army service, he went to Clare College, Cambridge, in 1918, where he graduated with first-class honours in both Part I and Part II of the Natural Sciences Tripos, and in 1921 he was awarded the Harkness Scholarship. In the same year he took the external B.Sc. honours degree of the University of London and joined the Geological Survey. In his first winter he revised some of the geological boundaries for publication of the Shaftesbury one-inch map. Hollingworth then took his place in the Survey's Cumberland unit first under B. Smith and later T. Eastwood to become part-author of the Carlisle, Brampton, Whitehaven, Gosforth and Cocker-mouth maps. Besides studying the Ordovician, Carboniferous and other bedded rocks, he showed that the Ennerdale Granophyre was a

stock and not, as previously supposed, a laccolith. He identified the components of the Carrock Fell igneous complex and inferred that they were intruded as steeply inclined sheets or elongated lenses after the main Caledonian folding and during a trough-like subsidence of the region. He also threw light on the glacial retreat phenomena of western Edenside and the Solway Basin, drainage problems of the River Eden and solifluxion phenomena. Inspired by data from Cumberland he made a statistical analysis of high-level erosion surfaces in Britain.

After two years spent mapping in the Droitwich neighbourhood he was transferred to work on the one-inch maps of the Huntingdon and Cambridge areas. In the war years he worked mainly on the structure, stratigraphy and reserves of the sedimentary iron ore field developed in the Northampton, Wellingborough and Kettering areas. As a substantial legacy to geology he contributed a demonstration, with other colleagues, that some structures revealed in the Jurassic rocks in the ironstone field were superficial Pleistocene features caused by adjustment forces producing valley bulging and valley side cambering. In all, Hollingworth was part author of twelve of the Geological Survey's one-inch maps as well as a memoir on gypsum and anhydrite. The latter subject he amplified later when dealing with facies problems in the Permian-Triassic related to evaporite deposition and stratal correlation.

Hollingworth was selected for the Geology Chair at University College, London, in 1946, in succession to W. B. R. King, who moved to Cambridge. He proved to be an invigorating teacher. His special attributes were to develop competence in field geology and an appreciation of the industrial applications of the subject. He initiated research by his students in south-west Ireland and, subsequently, he established research groups in the Caledonian orogenic belt of northern Norway and later in Chile.

Hollingworth had exceptional gifts in debating the results of almost any geological research and thus was a stimulating but always friendly critic. These gifts were canalized into the affairs of the Geological Society of London, which he served as Secretary from 1949 to 1956 and as Vice-President (1956-58 and 1962-64). He was President from 1960 to 1962 and received the Society's Murchison Medal in 1959. He leaves a widow and two sons.

C. J. STUBBLEFIELD

Prof. P. Maheshwari

THE sudden and untimely death of Professor Panchanan Maheshwari on May 18, 1966, at Delhi, where he was head of the Department of Botany at the University, is a sad loss to botany not only in India but throughout the world. His was a dynamic and stimulating personality and nobody who met him could fail to be impressed by his energy, sincerity and simplicity, even if these good qualities were occasionally masked by an arrogance that could be misunderstood by those who failed to see beneath it. Maheshwari was a man of boundless energy and high ideals who set himself and his colleagues a very high standard in all the scientific work which they undertook. He could tolerate nothing that was second rate and he did not mince his words when he encountered inefficiency or obstruction in any shape or form. He was a good teacher with a broad outlook who not only inspired but also really cared for his students, who hold him in high regard. And yet this broadness of vision was accompanied by ability to conduct research of a very high order in a specialized field, and his life's work on the embryology of plants is known throughout the botanical world.

Maheshwari was born at Jaipur on November 9, 1904, where he later went to school before proceeding to the Ewing Christian College, Allahabad, in 1921, graduating in 1925. Here, ably influenced and guided by the late Dr. Winfield Dudgeon, an American missionary teacher,

he took his M.Sc. and D.Sc. degrees at the University of Allahabad in 1927 and 1931, respectively. Joining the staff of Agra College, Agra, in 1930, he became associate professor in 1936. Subsequent appointments were at the University of Allahabad (1937-39), Lucknow (briefly in 1939), and he became reader and head of the department of biology at the University of Dacca later the same year. The best-known period of his career began in 1949 when he was appointed professor and head of the Department of Botany at the University of Delhi, a post which he continued to hold until he died.

Maheshwari travelled widely. During his first visit to Europe in 1936-37 he was greatly inspired by meeting the eminent embryologist Professor Karl Schnarf of Vienna, who gave him the idea of writing *An Introduction to the Embryology of Angiosperms*, which was completed at Harvard University in 1945. He was a member of and held office in numerous scientific societies, but, of these, perhaps particular attention should be directed to the fact that he was president of the Indian Botanical Society in 1951 and became founder and first president of the International Society of Plant Morphologists in the same year. This last society is responsible for publishing the journal *Phytomorphology*, first issued in 1951 and of which Maheshwari has been the sole editor.

Maheshwari's *An Introduction to the Embryology of Angiosperms* has for many years been widely recognized as the leading textbook on the subject written in English, and a Russian translation has also been published. The more recent *Advances in the Embryology of Angiosperms*, edited by Maheshwari and published in 1963, is also widely used. It is impossible here to survey his numerous publications in scientific journals and it must suffice to say that until quite recently most of them fell into the broad field of descriptive morphology with special emphasis on the embryology of flowering plants, using the term embryology in the broadest possible sense. With his marked capacity for sifting and arranging factual information, Maheshwari, having mastered a wealth of detail, classified and clarified the main lines of variation in plant embryology that are known to occur. He also discussed the taxonomic and phylogenetic conclusions that can be drawn from embryological knowledge. In recent years he turned his attention to the experimental side of embryology, and some investigations on this important aspect were still in progress when he died.

Because of Maheshwari's influence, the study of plant embryology and floral morphology has assumed an important role in the development of botany in India in recent decades, especially among Ph.D. students. There may be some who feel that these research exercises have been too repetitive. It must be remembered, however, that theoretical conclusions based on descriptive aspects of botany are likely to be invalid unless they are supported by factual information drawn from investigations that are extensive and thorough. It was because Maheshwari realized that this is so, and because of his heavy teaching and administrative duties, that he adopted the only course open to him in seeking the aid of many collaborators and students to achieve his aim. The result must be judged from the synthesis of these exercises which Maheshwari achieved rather than on the individual researches themselves, however valuable these may be. Viewed in this light, Maheshwari's contribution to botany is a notable one, especially when we remember that he himself regarded his own work as only a part of the even broader synthesis of descriptive botany that will become possible when his contribution has been added to that of related morphological disciplines.

Maheshwari, who was married at the age of 13, is survived by his widow and by three sons and three daughters.

I thank Professor B. M. Johri and other colleagues of the late Professor Maheshwari for providing some of the particulars included in this notice. C. R. METCALFE