

UNCLASSIFIED

AD NUMBER: AD0476860

LIMITATION CHANGES

TO:

Approved for public release; distribution is unlimited.

FROM:

Distribution authorized to US Government Agencies and their contractors; Administrative/Operational Use; 16 Dec 1965. Other requests shall be referred to Office of Naval Research - London, Arlington, VA 22203.

AUTHORITY

ONRL ltr dtd 8 Jun 1971

476860  
476860

OFFICE OF NAVAL RESEARCH  
LONDON

EUROPEAN SCIENTIFIC NOTES

No. 19-12  
16 December 1965



Distributed by the  
Office of Naval Research Branch Office,  
London

This document is issued for the information of U.S. Government scientific personnel and contractors. It is not part of the scientific literature and must not be cited, abstracted, reprinted, or given further distribution.

---

OFFICE OF NAVAL RESEARCH  
LONDON

EUROPEAN SCIENTIFIC NOTES

Edited by Bernard Epstein and Victoria S. Hewitson

16 December 1965

ESN-19-12

Tale of a Yak . . . . .	N.W. Rakestraw	203
<u>BIOLOGICAL SCIENCES</u>		
Second International Symposium on Inhaled Particles and Vapours . . . . .	C.H. Miller	204
Parasites and Disease . . . . .	C.H. Miller	205
Eye Infections Explained . . . . .	C.H. Miller	206
Meeting of the Physiological Society . . . . .	C.N. Peiss	206
23rd International Congress of Physiological Sciences . . . . .	C.L. Gemmill	207
Medical School of the University of Hong Kong . . . . .	C.L. Gemmill	207
Wellcome Historical Medical Library . . . . .	C.L. Gemmill	208
<u>EARTH SCIENCES</u>		
The Commercial Oceanology Study Group . . . . .	N.W. Rakestraw	208
A Voice for British Oceanography . . . . .	N.W. Rakestraw	209
Comments on Oceanography in Italy . . . . .	N.W. Rakestraw	209
Kiel Lighthouse . . . . .	N.W. Rakestraw	210
<u>MATHEMATICAL SCIENCES</u>		
National Computing Center for UK . . . . .	B. Epstein	210
University of Newcastle upon Tyne . . . . .	B. Epstein	210
<u>MISCELLANEOUS</u>		
Four German Universities Re-visited . . . . .	B.O. Seraphin	211
Royal Society Names Blackett . . . . .	E.H. Weinberg	214
<u>PHYSICAL SCIENCES</u>		
A New Isochronocyclotron for the University of Hamburg . . . . .	B. Hartocha	215
Conference on Holograms and Diffraction . . . . .	E.H. Weinberg	216
Conference on Power Application of Controllable Semiconductor Devices . . . . .	C.E. Barley	217
IEE Colloquium on HS 303 (Early Bird) and the Post Office Earth Station at Goonhilly . . . . .	H.I. Edelson	218
Conference on Spectroscopic Studies of Vibrational Modes . . . . .	M. Hans	219
<u>PSYCHOLOGICAL SCIENCES</u>		
Second International Conference on Applied Military Psychology . . . . .	J.K. Rasmussen	220
Supply and Training of Educational Psychologists in England and Wales . . . . .	J.A. Nagay	221
Second Annual C.S. Myers Lecture "Personality and Experimental Psychology" . . . . .	J.A. Nagay	222
<u>NEWS AND NOTES</u>		
What Price Prestige? . . . . .	edited by H. Fisher	222
What About Meat? . . . . .	N.W. Rakestraw	223
Personal News . . . . .	N.W. Rakestraw	223
Technical Reports of ONRL . . . . .		223
ESN Subject Index, Volume 19 . . . . .		224
		226

OFFICE OF NAVAL RESEARCH

EUROPEAN SCIENTIFIC NOTES

16 December 1965

ESN-19-12

TALE OF A YAK

Many tourists to London have been impressed by the might of a parade of the Royal Horse Guards. This prestigious regiment is known as "The Blues," and its name dates back to 1690 when, in the days of William III, they were in Ireland under their colonel, the Earl of Oxford, and known as the Oxford Blues.

What will not have been noted, very likely, is that the plumes of the officers' helmets are made of yak's hair. [Editor's note: This was gnus to me.] Since no one seemed to know the reason for this peculiar source of regalia, I looked up what information I could find about the yak itself.

From the Encyclopedia Britannica I learned that the yak, Bos grunniens, is a species allied to the bison. While domesticated yaks are often black and white, and sometimes of small size, they are inferior to the black wild yak, "which stands nearly six feet to the shoulder and is confined to the arid plateau of Tibet." From The National Geographic I extracted the additional information: "A yak is an exceedingly versatile animal. It gives wool for clothing, and the female, called a dri, gives milk to drink. Once a year yaks are bled and their dried blood is eaten. You can plow a field with a yak, ride a yak, or load it with a heavy pak. You can burn its dung for warmth. Its bushy tail commands a high price in India as a fly whisk. And when a yak falls over a cliff, its lucky owner (who, by law, is not allowed to kill his animal) inherits as much as 800 pounds of meat."

All this gives no objective reason for the presence of yak hair in helmet plumes. I can only surmise that in some dark way the yak is a status symbol. Since, in its wild state, it is uniquely indigenous to the plateaus of far-off Tibet, perhaps the mark of its caudal appendage in the military uniform is meant to suggest the once far reaches of the British Empire. Empires have been held together by filaments no less tenuous than the heavy strands of a yak's tail.

This surmise may be somehow connected with the next part of our story, that yak hair is getting into short supply, and the scarcity of sources for renewal may make it necessary to find a substitute. In commenting on the problem the London Times suggests that the Horse Guards may, like the Life Guards, have to make do with horsehair. Even the possibility of nylon has been mentioned in horrible but unfounded rumors. The recent course of history, nevertheless, has seen the sacrifice of many a status symbol.

In most historic crises, however, the cause is seldom completely lost. So, too, in this case; the Times also reports that there are three yaks in the London Zoo, and several calves have been born. Yak hair may still be possible to come by. Across the water in Canada, on the other hand, it is said that efforts to breed yaks have been discouraging, the female being uncooperative. It was said: "She may not have heard that the soldiers of the Queen needed her."

There are also economic factors to consider. The competitive outlets for the sale of yak hair include not only the fly whisks, already mentioned, but also, reputedly, wigs for ladies in India. And now, from an entirely unforeseen quarter, comes the report of a new and very intimate competitive use.

A correspondent writes in the Times that a moving picture troupe, on location in northern Britain, makes use of yak hair for "instant beard." It is explained that when chopped-up yak hair is sprinkled on a base of embalmer's wax (!) on the face of a movie actor, a perfect imitation of unshaven stubble results which will defy the camera's close-up.

The status symbol seems to be rapidly disintegrating. One contemplates the intricate mysteries of politics and wonders whether yak hairs in the plumage of a military officer and the "five o'clock shadow" on the chin of a movie hero have anything to do with the responsibilities of Britain east of Suez. Probably not.  
(N.W. Rakestraw)

BIOLOGICAL SCIENCESSecond International Symposium on Inhaled Particles and Vapours

The British Occupational Hygiene Society sponsored this well attended Symposium, which was held 28 Sept-1 Oct at Cambridge. Approximately 280 delegates, representing at least 20 countries of eastern and western Europe, Africa, North America and Australia, were registered.

The physical facilities, including the auditorium, simultaneous translation service, and projection equipment, were of excellent quality. The only objectionable aspect of the Symposium was timing; many speakers exceeded the allotted time, some as much as three-fold, so that discussion was limited.

The Chairman of the Organizing Committee, Mr. W.H. Walton of the Pneumoconiosis Field Research Unit, National Coal Board, Queensborough House, London, scheduled the 47 formal presentations to be given during seven consecutive sessions.

Six papers dealing with anatomy and physiology were presented during the first session. A group of French investigators (A. Policard, A. Collet, and C. Reuet-Normand) recommended the use of cats as laboratory animals because of small size, low cost, and the fact that the cat's bronchial system is comparable to man's. Experimental studies on the pathogenesis of pneumoconiosis in cats may well provide information which can be more easily extrapolated to man. An interesting presentation by Dr. Donald F. Proctor (Johns Hopkins Univ.) outlined a method of investigating the role of the human nose in particle clearance which involves external detection of radioisotopes placed upon mucosal surfaces through conventional scanning of the area and through a double collimated crystal scintillation detector probe.

Parts of sessions 2 and 3 were devoted to a series of 11 papers on the pulmonary response to dust. The first four presentations reported on investigations of airway changes due to irritants, viz., histamine, inorganic sulfates and textile dusts and/or their components. It was reported by Dr. J.A. Nadel, et al (Cardiovascular Research Inst., Univ. of California School of Medicine, San Francisco) that, under the conditions of their studies, histamine and zinc ammonium sulfate increase pulmonary resistance, decrease pulmonary compliance, and increase end-expiratory transpulmonary pressure. Dr. A. Bouhuys and associates (John B. Pierce Foundation Laboratory, New Haven, Conn.) reported that inhalation of selected textile dusts or their components stimulates histamine release in man and that the illness produced may be due to this mechanism. The pathogenesis of tissue lesions produced by

silica dust under varying experimental conditions was described by three different speakers.

Mr. I. Webster, et al (Pneumoconiosis Research Unit, Johannesburg, South Africa) discussed the possible significance of biologically active substances produced by the action of silica. Webster has investigated "silica shock" and noted an increase of a kinin, probably bradykinin, in the serum of experimental animals. Two papers were devoted to description of changes induced in selected cells of the lung following dust inhalation, and one investigator reported on the lesions produced by fluospar dust, radiation, and dust and radiation combined.

The latter half of session 3 and session 4 were devoted to ten reports on studies of lung clearance in animals. Dr. P. Gross, et al (Industrial Hygiene Foundation, Pittsburgh, Pa.) reported on the relationship of alveolar clearance to lesions of the respiratory bronchiole. Four dusts were administered to rats by inhalation and intratracheal injection, and it was demonstrated that the proximal portion of the racemus had a greater concentration of dust than the more distal regions. After three or four days this surface dust disappeared, presumably having been transported to the ciliated epithelium. At the same time, the evaginating alveoli of this region became dust-laden and the peripheral alveoli contain less dust. The concept of stasis in the diverticula of a relatively small passage that is draining a large area may explain the greater vulnerability of the proximal portion of the racemus to inhaled irritants.

The mechanism of alveolar clearance is open to question, as is evidenced by several papers reporting studies which support alternative theories. Some investigators believe that alveolar macrophages are most important in clearance, and they have investigated several methods of increasing phagocytosis. It is apparent that various animal species respond differently in these experimental studies.

Several investigations in which radioactive isotopes were used as an experimental tool were reported.

An interesting paper by Drs. G.M. Green and E.H. Kass (Boston City Hospital, Boston, Mass.) reported results of studies on mechanisms of resistance to bacterial infections in the lung. An aerosol containing a known quantity of organisms was used, and quantitative recovery studies were performed after exposing animals to ethanol, hypoxia, cold, and malnutrition. It was concluded that the effectiveness of lung clearance varies with the species of bacteria, the effect of exogenous agents on the lung, and the antibacterial

activity (especially the bactericidal action of alveolar macrophages) of host cells.

The fifth session considered papers relating to laboratory studies on lung deposition and clearances in man. The only paper dealing with vapors, "A study of the retention and subsequent metabolism of radioactive methyl iodide," by Mr. A. Morgan and collaborators (Atomic Energy Research Establishment, Harwell, England), was presented during this session. Morgan reported that retention was related to the respiratory rate, but that the retained iodide is broken down quickly and that when liberated it participates in normal iodine metabolism.

Drs. H. Altshuler, K. Palmer and N. Nelson (N.Y. Univ. Medical Center, New York City) presented two complicated papers explaining methodology and calculations for determining the regional deposition of aerosol in the human respiratory tract during breathing and during breath-holding.

The methodology for investigating dust clearance from the lower respiratory tract of man, utilizing a group of collimated scintillation detectors located at specific anatomical points about the chest after breathing a radioactive test aerosol, was described by Dr. P. E. Morrow and associates (Univ. of Rochester, Rochester, N.Y.).

The sixth session included a series of papers reporting on studies to correlate dust deposition in human lungs with quantity and site, with surveillance of atmospheric dust in the environment. The latter half of the session, consisting mostly of summaries of articles previously published in the open literature, was concerned with dose-response relationships in human pneumoconiosis.

The final session was limited to reports on evaluation of dust exposure. Most investigators presented parallel data collected by simultaneous sampling using different equipment. The problems of standardization of air sampling equipment and technology were discussed.

The Proceedings of the Second International Symposium on Inhaled Particles and Vapors will be published by Pergamon Press, Ltd. If readers wish information on material presented at the Symposium in advance of publication of the Proceedings, I shall attempt to be of assistance.  
(C.N. Miller)

#### Parasites and Disease

The First Joint Meeting of the British Society for Parasitology and the Royal Society of Tropical Medicine and Hygiene was held in London on 18 November.

The afternoon session was a Symposium on the Pathology of Parasitic Diseases, and the evening meeting, held at the London School of Hygiene and Tropical Medicine, consisted of almost four dozen demonstrations prepared by members or fellows of the two organizations. The Symposium consisted of four formal presentations: Entamoeba histolytica in man, by Air Commodore W.P. Stamm, RAF; Pathogenic processes in malaria, by Prof. H.G. Macgregor; Pathogenic and expulsive mechanisms in gastrointestinal nematodes, by Prof. W.F.H. Jarrett; and The relationship of host to parasite in human hookworm infection, by Dr. P.A.J. Hall.

Stamm presented data from a personally conducted survey and reported that early reinfection with E. histolytica appears to be very common among the indigenous population of the selected underdeveloped countries. When a "tropical population" was under observation in the UK, there was still considerable reinfection, but only about 1.5 percent cross-infection of UK personnel. He found no correlation between parasitic infestation and symptomatology. Stamm's experience leads him to agree with the literature that only about 50 percent of carriers demonstrate evidence of tissue invasion and that invasiveness depends more upon host factors than upon the parasite.

Macgregor emphasized the philosophy of considering host-parasite-environment interrelationships. He outlined his own research into the effect on host-cell metabolism produced by parasitism with Plasmodia of the cell. Factors which can alter host immunity, thus affecting the parasite, were discussed. The effect of altering the chemical environment of the parasite, as by drug administration to the host, may well stimulate utilization of alternative metabolic pathways by the parasite.

Jarrett presented a well-illustrated description of the host response to infection with nematodes of the genus Ostertagia. The tissue response was studied by sacrificing experimentally infected cattle and sheep at frequent intervals. Selected biochemical parameters were investigated and changes were correlated with the tissue reactions and worm expulsion into the stomach.

Hall commented briefly on the host-parasite adaptation by man and Necator americanus throughout the centuries of their co-existence. He spent considerable time philosophizing about host immunity and suggested that symptomatic hookworm disease, regardless of parasitic load, is due to a "breakdown of immunity." Some data, derived from isotope studies, relating to hemoglobin and protein loss,

were also presented. It appears that the protein loss can be twice that expected from blood loss per se.

It was possible to visit only a small portion of the laboratory demonstrations in the allotted time.

The greatest value of such joint meetings is to alert the scientist to the clinical problems and, hopefully, to stimulate basic research that can be quickly applied to combatting the health problems of man. (C.H. Miller)

#### Eye Infections Explained

A press release in London newspapers on 23 Nov revealed that the 1964 outbreak of infection at the Birmingham Eye Hospital was due to contaminated saline. There were two separate episodes in which 15 patients were infected and six lost the sight of one eye. The first episode occurred in August, and the second in October.

The investigating committee reported that the offending organism in the first instance was Ps. pyocyaneus, while S. aureus was responsible for the second. There was no explanation as to how the irrigating solution became contaminated.

The operating theater was closed after each of the unfortunate outbreaks.

It is reported that a detailed report is in preparation for publication in the medical literature. (C.H. Miller)

#### Meeting of the Physiological Society

A number of interesting communications and demonstrations were presented at this meeting, which was held at the National Institute for Medical Research (NIMR), Mill Hill, London 5-6 November.

Fox, Goldsmith, Hampton and Hunt (Div. of Human Physiology, NIMR) presented a paper on the influence of acclimatization in man on his temperature regulation when at rest in a comfortable environment. Temperatures were recorded from the mouth, rectum, tympanic membrane area, intestine (radio pill) and six cutaneous sites. All readings were made hourly for 48 hours, except for oral and rectal readings, which were discontinued at night. An identical set of measurements was made after heat acclimatization. Following acclimatization, the four internal temperatures were all significantly lower (0.12 to 0.19° C) than control values. There were no significant changes in the skin temperatures. The data appear to rule out a number of possible explanations for these observations, including increased sensitivity of thermoregulatory mechanisms, change in diurnal

temperature cycle, and a change in core-to-periphery temperature gradients. It was concluded that acclimatization to heat results in a lowering of the level at which internal body temperature is regulated.

It had been reported at a meeting of the Physiological Society held earlier this year that anion permeability of frog muscle is increased by acids in the presence of nitrate and iodide ions. At this meeting, Hutter (NIMR) presented exactly opposite results. Paired frog sartorius muscles were loaded by soaking in solutions containing Br<sup>82</sup>. The paired muscles were then placed in a solution containing nitrate or iodide. The efflux of Br<sup>82</sup> was then followed for three periods. Efflux from the first muscle of the pair was measured at pH 5.0, then at pH 9.8, and again at pH 5.0. Efflux from the second muscle of the pair was measured at pH 9.8, then at pH 5.0, and again at pH 9.8. It was found that anion permeability in the presence of nitrate and iodide ions was always greater in the alkaline solution.

Fink, Nallar and Worthington (Oxford) presented a beautiful paper which demonstrated the presence in rats of a luteinizing hormone-releasing factor (LRF) in hypophysial portal blood at a concentration above that found in peripheral systemic blood. Exposure of the pituitary stalk was accomplished by a pharyngeal approach. After the caudal end of the stalk had been sectioned, portal blood was collected through a fine polyethylene catheter. Samples of approximately 2 ml could be obtained in a 2-hour period. An equivalent amount of peripheral blood was collected periodically from the femoral vein. LRF was assayed by the ovarian ascorbic acid depletion method. Portal blood was nearly three times as active as peripheral systemic blood in depleting ovarian ascorbic acid in these experiments. Similar results were obtained in a group of hypophysectomized rats. It was subsequently shown that LRF is a molecule of low molecular weight, possibly a polypeptide.

Harris and Rocha e Silva (NIMR) presented a paper on the central effect of bradykinin in stimulating release of ADH. Intravenous injection of bradykinin in cats under chloralose anesthesia does not result in ADH release until doses large enough to produce severe hypotension are used. Hypotension itself has previously been shown to cause secretion of ADH. Intracarotid injection of small doses of bradykinin, however, produced significant release of ADH with relatively small effects on blood pressure, as did intravertebral injection. The data indicate that bradykinin appears to produce release of ADH by a

central action that is independent of the hypotensive effect of bradykinin.

Kosterlitz and Wallis (Aberdeen) demonstrated a modification of the sucrose-gap method as applied to the isolated superior cervical ganglion of the rabbit. With this technique changes in both resting membrane and action potentials can be recorded. For example, depolarization by 1.65 mM acetylcholine amounts to 2.5-8.0 mV, and the amplitude of the evoked action potential to 10-20 mV.

Hellon and White (NIMR) demonstrated a technique for correlation of unit activity in the hypothalamus and local hypothalamic temperature in conscious rabbits. In a lightly restrained animal, a microdrive unit is used to lower a metal microelectrode and a thermistor into the brain through a previously applied stainless steel plate. Brain temperature can be varied by means of a thermode or by means of silver coils placed around the carotid arteries. The amplified unit spikes are recorded on one channel of a tape recorder. Brain temperature, time and a coded event signal are digitalized and recorded on a second tape channel. The spike track is then played back through a pulse height discriminator, and the digitalized channel is sampled at corresponding times. These data are then led to a final read-out such as a printer or paper punch.  
(C.N. Peiss)

#### 23rd International Congress of Physiological Sciences

This Congress was held in Tokyo, Japan, 1-9 September. The First International Congress was held in Basel in 1889 with 130 attending. The Congresses have been held every three years with the exception of wartime. It was estimated that about 3,000 persons from 47 different countries attended the Tokyo Congress.

Each member was given a program, abstracts, list of participants, a history of physiology in Japan, a medal, and invitations to receptions. The program was divided between invited lectures, symposia, films and demonstrations, and fifteen-minute communications.

The meeting was opened by a Welcome from Ken Yasui, Director General, Prime Minister's Office, by Greetings by Umekichi Nakamura, Minister of Education, an Opening Address by Prof. Genichi Kato, President of the Congress, and by Prof. A.V. Hill, of London. Prof. Kato outlined the organization of this Congress, stating that there were 1208 communications, with 945 from abroad and the remainder given by Japanese workers. There were 12 invited lectures and 12 symposia with 70 outstanding scientists taking part. Prof. Hill told of previous congresses and stressed the friendly relationships established by these international meetings. Prof. Chandler M. Brooks, Dept. of Physiology, Down-State Medical Center, Brooklyn, NY, was presented an award for his part in preparing the history of physiology in Japan.

After the Inaugural Session there was an excellent reception at the Hotel Okura. The following days were occupied with the many scientific sessions. All phases of physiology were covered. For example, in thyroid physiology, Dr. J.E. Rall of the National Institutes of Health gave an invited lecture on "The Mechanism of Action of the Thyroid Hormone." There were two separate sessions on the thyroid. One day was devoted to pharmacology. It would be impossible to cover all phases of this Congress. The abstracts and the symposia will be published. The Congress banquet was held Saturday night. On Monday evening, the Governor of Tokyo gave a reception.

The next Congress will be held in Washington in 1968.  
(C.L. Gemmill, Univ. of Virginia School of Medicine, Charlottesville, Va.)

#### Medical School of the University of Hong Kong

I recently had the opportunity of visiting the Medical School of the Univ. of Hong Kong. The Hospital and Medical School are located about a mile from the main center of the University. The Medical School is housed in a multi-storied modern building with good facilities for teaching and research, and the staff has ample laboratory space.

In order to be admitted to this Medical School the candidate must have passed examinations in physics, chemistry and biology. The work in the School is divided into the pre-clinical and clinical curricula. The pre-clinical subjects include organic chemistry, anatomy, physiology and biochemistry. The subjects of the clinical curriculum are pharmacology, pathology, medical jurisprudence, preventive and social medicine, pediatrics, medicine, surgery, obstetrics, and gynecology. Before taking the final examination, the candidate must finish clinical clerk appointments and be twenty-one years old.

Instruction is in English and the standard texts used in American and British schools are employed in instruction. A medical graduate must complete one year of satisfactory service as a staff member of an approved hospital before he can obtain full registration with the Medical Board of Hong Kong. He is then eligible for registration also in the United Kingdom.

The Medical School overlooks one of the scenic bays of Hong Kong with good views of the green hills surrounding the blue water.  
(C.L. Gemmill, Univ. of Virginia School of Medicine, Charlottesville, Va.)

### Wellcome Historical Medical Library

The Wellcome Historical Medical Library was established by Sir Henry Wellcome and was opened to the public in 1949. Sir Henry, an American, founded the Burroughs-Wellcome Company, manufacturer of drugs. He had a deep interest in medical history and collected books, manuscripts, prints, letters and objects relating to medicine. The Library is devoted entirely to the history of medicine and to the preservation of his collections. It contains around 250,000 printed books, pamphlets, and journals. In addition, there are over 100,000 autographed letters of medical importance. It is, therefore, the largest library of its kind.

The collections are housed in the Wellcome Building and are crowded for space, due to the use of this building for general office purposes. However, there are plans to move the offices to another location and to give the needed space to the Library. The reading room is large and comfortable, and is surrounded by a balcony, which contains alcoves with desks for individual workers. There are sections on general history, theology, general science, physics, chemistry, biology, the history of medicine, medicine in various countries, and the various subdivisions of medicine. Also, the current issues and bound copies of the numerous journals on the history of medicine are located on the balcony, with easy access for the reader. Below the balcony are illuminated many of the outstanding names in medicine. There are two additional rooms, one for books on American medicine and the other for Oriental and Arabic medicine. Both of these rooms have display cabinets for their outstanding books.

On the lower floor of the reading room, there is the librarian's desk, card catalogs and the standard reference texts, encyclopedias, dictionaries, biographies, books on books, and catalogs of books and manuscripts. Standard catalogs such as the British Museum Catalog and the Index Medicus are available here. The numerous reference texts to the incunabula are available. This room is used for the storage of large folios. Display cabinets containing some of the outstanding items are found in the entrance hall and in the main room.

The card catalogs are very complete. In the usual English library it is the custom to have only an author index. Here, however, there are also subject, data and place catalogs. If, for example, a reader would like the medical books published in Paris between 1610 and 1620, he can readily obtain this information.

Most of the books are stored in stacks closed to the public. Some are kept in another location on account of the crowded

condition, but may be obtained when wanted. The collection is now being catalogued in bound volumes. The catalogs of incunabula, western manuscripts and books printed before 1641 have been published. Work is in progress on cataloguing the remainder of the collection and issuing bound catalogs of the Arabic and Oriental books.

Part of the collection of medical objects is on display in the Museum. On the ground floor are five complete apothecary shops and an excellent display depicting diseases of the tropics. On the upper floors are displays of medical and surgical instruments, apothecary jars from many countries and other items of medical-historical interest. There is also an exhibit which is changed frequently. Last summer, there was an exhibit of the medical aspects of the Battle of Waterloo, including surgical instruments used in this battle, maps, and many other items. There is also a good collection of instruments and books relating to vaccination.

Additional information may be obtained by writing to Mr. E. Gaskell, Librarian, Wellcome Historical Medical Library, Euston Road, London, NW 1, England. (C.L. Gemmill, Univ. of Virginia School of Medicine, Charlottesville, Va.)

### EARTH SCIENCES

#### The Commercial Oceanology Study Group

Six British industrial organizations have banded together to form the Commercial Oceanology Study Group. The members of the Group are: British Petroleum; Richard Costain, Ltd.; Rio Tinto Zinc Corporation; Hawker-Siddeley; Unilever; and Imperial Chemical Industries. It will be noted that these companies are not competitive. Each one is active in a different field: petroleum, construction, mining, general engineering, food, and chemicals, respectively. They have a permanent secretary, Dr. N.C. Flemming, a marine geologist, whose office is at 111 Westminster Road, London.

The general objective of the Group is to survey all of that field which in the US is variously known as ocean engineering, undersea technology, etc. The various suggestions appearing in the press and scientific magazines are collected and examined. The research laboratories, industrial and academic, are visited and all other available sources are probed for suggestions of possible projects for the economic exploitation of marine resources. This information is analyzed to determine the economic possibilities of the various suggestions. Pure and applied research and development work when feasible are encouraged or undertaken by members of the Group. Modern methods of data storage and retrieval are applied.

The respective commercial activities of the members of the group obviously cover most of the field of marine resources, without competition between them.  
(N.W. Rakestraw)

#### A Voice for British Oceanography

Lord Florey, in his retiring presidential address to the Royal Society, referred to some matters which are worth mentioning here. He expressed his concern over the increasing cost of modern science. The very term "big science," applied most particularly to the large-scale operations in the space and nuclear fields, carries with it the implication of enormous sources of support. He discussed the combination of national science programs with international efforts, in order to spread the costs, but eventually one reaches the stage where national objectives become competitive, and it is essential that in a country like Britain scientific efforts converge on those fields from which technological advances are most likely to appear.

In meeting these challenges for the support of science, the taxpayers, who foot the bill, may hope for some of the spectacular returns which dazzle their counterparts in the US or the USSR, in the form of space exploits. Since this seems beyond reach, Lord Florey wondered whether "by concentrating on the still little-known world beneath the ocean, Britain, a pioneer in oceanography, might find here a field in which she could hope still to lead the world."

This is certainly not beyond hope. Britain has the lead over any other country of Western Europe, but to bring this hope to realization will require much more substantial interest and support than is now being given by the Government, the Navy, or the public. The quality of British effort in this field is excellent; the quantity needs to be increased. It would be cheaper than the struggle to reach the moon -- and quite possibly more productive.  
(N.W. Rakestraw)

#### Comments on Oceanography in Italy

In 1964 Richards reported in comprehensive fashion on the oceanographic activities in Italy (ONRL-23-64), and I shall merely summarize impressions gained from recent conversations with Drs. Carlo Morelli and Bruno Battaglia.

Richards' report was somewhat pessimistic but indicated the likelihood of slow, steady progress in oceanography in Italy. Two subsequent events have seriously interfered with this progress, however: the death of Prof. d'Ancona and the replacement of Prof. Giovanni Polvani as President of the Italian Research Council (CNR). The

former was perhaps the dominant Italian figure in the field, but some of his functions have been most ably assumed by Battaglia. Polvani, because of his personal interest in the field, was responsible for the favorable policy of the CNR toward the development of oceanography. He had been largely responsible for the acquisition of the R/V BANNOCK and for its equipment and reconversion -- at a cost of nearly a million dollars, incidentally. A national oceanographic center was established, which, as a center, was a geometric paradox, since it consisted of laboratories at a number of different places throughout the country.

On the appointment of a new President of the Council, however, all plans were canceled and interest in oceanography lagged. However, it is reported that interest is again increasing, and it may be that some of the previous *status quo* will be restored. Nevertheless, the future is not too bright.

Most of the present activity is in the areas of Venice and Trieste. Battaglia, who is primarily a marine biologist, is a professor at the University of Padua, but he spends part of his time at the small biological station in Chioggia and at the Centro Nazionale di Studi Talassografici in Venice where, under his general supervision, Dr. C. Franco operates a program mostly concerned with primary productivity in the upper Adriatic. Battaglia has 22 students in oceanography and marine biology.

Richards has described the organization, facilities and programs of the two institutes in Trieste, the Istituto Sperimentale Talassografico and the Osservatorio Sperimentale Geofisico. The latter institute, of which Morelli is director, is the second oldest institute of geophysics in Europe, founded in 1841. It was preceded only by the one in Göttingen, founded in 1831.

There are several smaller centers, principally biological, elsewhere, and the nuclei for oceanographic development at Messina and Taranto. At such places as these there are individual workers who, in the tradition of European science, carry on research independently with little outside contact. Trotti, Picotti, Morelli, Battaglia, and Giuseppina Aliverti, however, are occasionally to be seen at international meetings.

The picture of oceanography in Italy is rounded out with the Istituto Geofisico e Geodetico Università in Genoa and the Italian Navy.

The conditions under which the BANNOCK was acquired from the US have been recounted by Richards. Its reconversion is said to have been carried out rather unintelligently, with little attention to the needs of oceanographic research. After the expenditure of

a great deal of money it is still not adequate and needs further work. Unfortunately, even when completed it may not be available for oceanographic work, for there are said to be indications that the Navy will take it over for other purposes. In any event, the research laboratories could probably not afford the expense of its operation, and they are hoping for the construction of a new and more suitable ship. Meanwhile, the Navy is looking to the Research Council for help.

Morelli's personal work concerns gravity determinations at sea. He and his collaborators have been carrying out surveys in the Mediterranean, largely in cooperation with the SACLANT base at La Spezia. They have covered the principal portions of the Ligurian Sea and the western Mediterranean as far as Gibraltar. They plan soon to invade the eastern part of the Mediterranean and the southern Adriatic. These surveys have been concerned not only with gravity determinations but also with geological coring, magnetic observations, and bathymetry. It is important that the bathymetric survey be carried out in great detail because earlier bathymetric charts of the Mediterranean are frequently in great error, as much as 200 meters.

Morelli has been using not only the ships of the SACLANT base but also Italian vessels, the VERCELLI (a small ship principally used for biological work) and the BANNOCK.  
(N.W. Rakestraw)

#### Kiel Lighthouse

Subaerial as well as submarine operations are going on in north European waters. While a half-dozen companies are drilling frantically for oil and gas on the North Sea floor, the Germans are quietly constructing a lighthouse of an entirely new type off their Baltic coast near Kiel. This will be the first aluminum lighthouse in operation, 12 feet in diameter, weighing 55 tons and standing 100 feet above its massive concrete base. Its operating cost will be less than half that of the lightship which it will replace, and as a stationary signal it will provide more accurate light sectors for navigation. Attached to the central base are enormous piers to afford a lee shelter for pilot boats. The aluminum tower itself contains several stories, or "decks," providing living quarters for pilots and rooms for machinery, operation and storage, while above the lantern deck is a radar antenna. The light itself, consisting of nine sectors and visible for 30 miles, is built in duplicate, along with all the operating gear of the tower, with one installation in "stand-by" status in case of failure of the other. The light is controlled by radio from Kiel, where power is delivered by cable. Any interruption of the power supply automatically starts an auxiliary diesel generator. Additional

equipment includes a fog warning signal, radar installation, a tide gauge and a hydrographic station. There is also a landing area for helicopters, with special facilities for landing in bad weather.  
(N.W. Rakestraw)

#### MATHEMATICAL SCIENCES

##### National Computing Center for UK

On 7 December Mr. Frank Cousins, Minister of Technology, announced plans to establish in Manchester a national computing center. The center will be organized as a non-profit corporation, in which membership will be available to British manufacturers and users of computing equipment as well as professional computer organizations. The corporation, which is expected to reach full-scale operation in 1970, will be run by a council appointed in part by the Minister of Technology and in part by the membership.

Among the functions of the new center will be to encourage the use of computers in British industry, to promote the expansion of computer manufacturing in the UK, to reduce duplication of effort by serving as a source of advice and information concerning programs currently available, and to promote training in the various phases of computer science. It is not intended that the center will itself perform programming or computing services.

Gordon Black, technical director (computing) in the reactor group of the Atomic Energy Authority and part-time professor of automatic data processing in Manchester College of Science and Technology, has accepted the directorship of the new center. It is anticipated that the center will be located in the area between the College and the University, which is now being re-developed. The leading role played by Manchester in the development of computing in the UK was undoubtedly a major factor in the decision to locate the new center in that city.

The government has made a commitment for an initial expenditure of £800,000 (\$2.24 million).  
(B. Epstein)

##### University of Newcastle upon Tyne

According to an American legend, the typical New Yorker believes that the entire area of the US west of the Hudson River consists exclusively of Chicago, Hollywood, one or two minor towns, and a vast wasteland in between. Ridiculous though this picture may be, it is not dissimilar to the concept which the typical American academic seems to have of England's university system. According to this view, virtually all of England's university activities are concentrated at Oxford and Cambridge, with the remainder being relegated to London: perhaps he is also aware of Manchester.

Without in any way seeking to deprecate the great significance of these centers of scholarship, I believe it worthwhile to devote a few paragraphs to urging the American scientist, whether he is in industry, government, or the groves of Academe, to acquaint himself with the activities of England's provincial ("red-brick") universities. While this feeling has been growing on me throughout my "tour" with ONR London, which began about 1½ years ago, it has become especially strong as a result of a recent two-day visit to the University of Newcastle upon Tyne, in the northeastern section of the country.

This institution has, in reality, been a full-fledged university for about a century, but until 1903, when it received independent status, it was a part of the University of Durham. (Now that the separation has occurred, the latter institution, located about 10 miles away, is considerably smaller than its robust offspring.)

Mathematical activities at Newcastle are conducted in two main groupings: the Department of Mathematics and the Computing Laboratory. The former, in turn, is divided (functionally, but not officially) into sub-departments of pure mathematics, applied mathematics, and statistics, headed respectively by Professors J.R. Ringrose, A.E. Green, FRS, and R.L. Plackett.

Ringrose and his half-dozen colleagues, almost all of whom are very young, constitute a strong research group in functional analysis and algebra. Its one weakness, which is readily acknowledged, is that in its enthusiasm for ultramodernity and ultra-abstractness it has neglected to provide an adequate amount of classical analysis (the source of most of ultramodern abstract mathematics) in the undergraduate curriculum; it is hoped to correct this imbalance soon.

Green, together with Prof. P.H. Roberts (who has transferred from Newcastle's Department of Physics), leads an extremely active group of workers who are primarily interested in elasticity and hydrodynamics, but relativity is also represented. Actually, Green is primarily interested in the fundamental mathematical principles of continuum mechanics, rather than in grinding out solutions to particular problems; he is certainly one of the most prominent workers in this field.

Plackett heads a small but active group of statisticians with a sophisticated mathematical approach.

The three subdepartments cooperate in presenting a vigorous program of undergraduate instruction; after a rather rigidly prescribed course in the first year there is some freedom in exercising options during the remaining two years of study for the BSc degree.

The Computing Laboratory, under the directorship of Prof. E.N. Page, provides some undergraduate instruction for students in mathematics, as well as in other parts of the university. It also conducts an excellent program of graduate instruction leading to the MSc degree, and a number of members of its research staff earn their doctorates. The Laboratory, which operates an English Electric KDF9, conducts a bewildering variety of research projects and computing services, both in its own interests and for other parts of the university. Currently housed in three converted residences, it will soon occupy part of a new building which is currently being built in the heart of the campus. It is then hoped to secure a larger machine, with multiple access, and it appears likely that, despite the tightness of funds, the University Grants Committee will act favorably upon Page's request. It is planned, incidentally, to keep the KDF9 for less demanding computational services.

Newcastle's major difficulty, insofar as undergraduates are concerned, is that it finds difficulty in attracting students from other areas. The bulk of its undergraduates come from the vicinity, and their average quality apparently leaves something to be desired. The economic plight of northeastern England, caused largely by the decline of shipbuilding and coal mining, adds to the difficulties. On the other hand, the caliber of the faculty serves to attract graduate students of good quality to Newcastle for their doctoral research.

Leaving the field of mathematics, we conclude with the remark that the University of Newcastle serves as a center of research in Romano-British archeology. The eastern end of Hadrian's Wall still stands at the suburban town of Wallingend, and large parts of the Wall can be seen and studied as one crosses the country to Carlisle. The University possesses a splendid Museum of Antiquities whose primary source of supply consists of the Wall's remains. (B. Epstein)

#### MISCELLANEOUS

##### Four German Universities Re-visited

This reporter is a post-war product of the university system in Germany, where he was born and lived until nine years ago. Absent more or less continuously ever since, he enjoyed a recent opportunity to visit for two weeks four German universities and technical universities (Frankfurt, Darmstadt, Karlsruhe and Stuttgart). He realizes that neither the number of places visited nor the time spent guarantees anything like a representative sample, but since most of his observations point in the direction of a notable change, there may be some value in even a superficial report.

Two features of the staffing and administration of a German university institute used to be typical of the whole system: First, there used to be only one professorship ("chair") in each institute, and the holder of this position, who, as director, exercised full power in the institute, was almost invariably rather elderly and past the peak of his scientific creativity. /According to a report by the British Committee on Higher Education (Robbins Report, Appendix 5, p. 91, 1963), in 1957 the average age at which professorial status was reached was 45. This included assistant and associate professors as well as the holders of chairs. / Running his institute dictatorially for fifteen years or so, the director blocked the way for younger and more dynamic scientists who were still staying in touch with living science. How strictly this system was adhered to, even after World War II, is shown by comparing the numbers of professors and students over an interval of more than 30 years. In 1928 there were 3050 holders of professorial chairs as against 111,000 students. Thirty-two years later, in 1960, the number of students had almost doubled to 200,000 while the number of chair-holders had risen only imperceptibly, to 3160. (Robbins Report, Appendix 5, p. 92, 1963.) The worldwide image of the German professor as an old man with a beard who is somewhat removed from reality had apparently survived WWII and was to endure forever.

Secondly, the age and lack of intellectual vitality of many full professors was especially detrimental, as the men at the top were able to run their institutes in a rather autocratic manner. The activities of the institute are determined to a great extent by the ideas of its director, with plenty of margin being granted to him by the traditional philosophy of academic freedom. In a system of higher education which tended to minimize formal rules and restraints (as reflected by the absence of "course requirements," "credits," etc.), the directors had little difficulty in maintaining full control of their institutes. Curriculum, seminars and colloquia, the selection of the staff members and their program of research, all these would reflect the particular scientific orientation and experience of the director. In this way a director of a typical institute would dominate the professional lives of perhaps eight staff members, in contrast to American universities, where there are perhaps three junior staff members to each professor.

It was therefore very gratifying to observe considerable improvement with respect to the age of the chair-holders. The following remarks are based upon observations made at the institutes specializing in solid-state physics at the universities named above, but there have probably been corresponding improvements in other disciplines.

In all four universities, some of the institutes are run by full professors who are not yet 40 years of age. All of them have distinguished themselves recently in some up-to-date branch of physics, and most of them have spent a year or more in the US. Room was made for them by doubling or trebling the number of existing physics institutes and by endowing them so generously that they soon became the major centers of physics in their respective universities. It is interesting that these young directors were apparently in a strong bargaining position during the recruiting phase of their employment. The "deals" which some of them worked out with their respective state ministers of education resulted in substantial budgetary increases, reportedly by a factor of five in some cases. This indicates that the change in policy apparently comes from the top of the system.

Two full professors now sometimes share the authority within an institute. In order to lighten the administrative load, new professorial posts have been established, with the title "Wissenschaftlicher Rat" (Scientific Counselor).

The fact that younger and more dynamic scientists are now in charge of the institutes lessens somewhat the traditional concern over the fact that they still run their organizations in the traditional autocratic manner. The research program of the institute still reflects the director's own interest and specialty. There is little chance of advancement or of more-than-minimum funding for a staff member who indulges in his own specialty. This presented hardships for some older members of the faculty, who had to change their field of interest in order to hold on to their position.

However, a certain balance is guaranteed by the existence of as many as three institutes in solid-state physics alone at a single university. Furthermore, the field of interest of the young director will usually be something very much in the focus of interest anyway, so that a certain concentration of effort is far from objectionable. This is reflected in the up-to-date character of the research program, a large part of which is conducted by the MS and PhD candidates who are completing their thesis work under the supervision of the staff members. It seems to be a general requirement that the thesis work for the diploma (equivalent to the MS degree) should reproduce some very recent work published elsewhere. A typical diploma candidate will try to reproduce, improve or amend the experimental results reported in a recent Physical Review article. In their subsequent doctoral work they will then strike out on their own. Most of them are aware of the latest results and trends in

their speciality, talk competently about it, and seem to float right in the mainstream of solid-state research. The final examination, however, throws them off their research track for some months by forcing them to memorize material foreign to their research. To make this questionable process effective in all its stupidity, examinations in as many as four heterogeneous fields must be passed within one week or so, calling for the simultaneous presence of all this useless and soon-to-be-forgotten knowledge.

Another regulation, apparently dating from the time when German science was second to none, requires the publication of the candidate's research in German, at a time when a large fraction of German scientific journals are being printed in English. Many complaints were heard about this and most candidates plan to submit an abridged version of their thesis in English as soon as possible, in order to make their results known to a larger group. The technical language around German research institutes is loaded with English expressions, anyway, which no one bothers to translate. This was true some years ago in the case of nouns of technical character, and it actually worked in both directions between German and English. Now, however, things are "chopped off," "switched," and so on -- words for which there are perfect equivalents in the German language. Since this reporter, as far as physics is concerned, is able to speak only what is sometimes referred to as "Immigranto," he asked permission to deliver his lectures in English and apparently "got across," even at the graduate student level, since the subsequent discussion was very lively. This increasing predominance of English in scientific communication -- in spite of stubborn, desperate French efforts to turn the tide -- is explained not so much by a special suitability of this language as by the fact that the people who contribute most heavily to the field speak no other language.

The equipment funds of most laboratories seem to be adequate. Although larger items of equipment still seem to pass from group to group as the need arises, there is enough around for everyone's needs. Very little make-shift or home-made equipment is seen. The old university tradition of making as much as possible in the machine shop has apparently been abandoned.

The electronic equipment is to an almost embarrassing extent of US origin. Waking up from a long sleep in one of these laboratories, I would believe myself to be at an American university. Even when similar German equipment is available, the US version, even if slightly more costly, is usually preferred for reasons of superior quality and performance. Even large and expensive items do not seem to present financial problems; for example, in each of the four

universities visited a Varian ESR spectrometer costing \$50,000 is being used. Beckman and Perkin-Elmer spectrographs testify further to the generosity of the funding.

These big pieces, of course, do not come out of the annual budget of the institute. They are purchased with grants from the Deutsche Forschungsgemeinschaft (German Research Council). This Council receives funds from both the Federal and the State governments and distributes them for research projects in institutes of higher education. A Senate staffed with 27 members elected from the universities ensures cooperation with the universities and supervises the different specialist committees which decide on the grant applications. This body acts as a reliable and research-minded buffer between the treasury and the universities.

Research contracts with the German defense departments are rather unpopular. It is felt that they are offered only for work that is located on the far "D"-end of the R and D spectrum, so that there is no overlap with the research program of most universities. Private industrial laboratories, although better adapted to applied work, also see little advantage in taking on this type of work. Unreasonable clauses concerning patent and priority rights in these contracts make large-scale efforts in this sector uninteresting.

It must be pointed out, however, that the financing of research presents a picture which is rosy only in certain spots. The funding level is far from being homogeneous throughout the German universities. Whether an institute is funded generously or poorly depends primarily upon the man in charge. If one of the young directors was hired only after considerable recruiting efforts, he was usually in a position to strike a bargain with his minister of education; this could result in a substantial budget increase, as mentioned before. If the old director stayed on, however, he would still operate on a rather small budget, and this would sooner or later put him behind his younger counterpart in the new second or third institute.

Building of new facilities, which is financed by the state governments, is progressing on a large scale throughout Germany. Institutes which are now accommodated in old or temporary buildings will in many cases soon move to new and more adequate quarters. Particularly impressive is the new campus of the Technische Hochschule Karlsruhe. Presently housed in former Army barracks, it will move next year into a number of multi-story buildings which in over-all appearance compare favorably with the new campuses of the University of California, to name just one example known by this writer. No complaints are to

be heard about the building program. On the contrary, one often encounters the criticism that the universities were favored just a little too much in this respect, and that something equally energetic should now be done for the high schools, which are in urgent need of improved facilities.

It is interesting to note that these large-scale building programs provide only limited funds for the construction of student residences. According to the Robbins Report (Appendix 5, p. 97, 1963), only 10 percent of the 221,400 students in German universities in 1962 were accommodated in dormitories. This is in line with the German tradition, which considers a university to be primarily a place of teaching and learning, and pays little heed to the educational advantages to be gained from communal living. The German student continues to live in private lodgings, without the interdisciplinary contact that American dormitories offer. Although facilities are provided for dining and recreation, the German university of the near future will still occupy one end of the spectrum of possible educational attitudes, with the community life and the tutorial system of the British college at the other end, and the typical American university somewhere between.

These new facilities will be adequate for some years, since the number of students is declining. This is simply a consequence of the sharp reduction in the birth rate following the war. Student numbers will return to the 1962 level only after 1970. In view of the recent economic prosperity in Germany, it is amazing that there is little hope of avoiding this drop in enrollment by inducing a larger fraction of the population to seek a university training. No massive expansion of higher education can reasonably be expected in Germany in the near future. Since universities charge virtually no fees and stipends are easy to obtain, this unfavorable prospect is not due to financial factors. The reason can rather be found in a deep-rooted social tradition, which even WWII was not able to shake: Going to a university or influencing one's offspring to do so still seems to be appropriate only for certain selected groups in German society today, with such a tradition in their history and background. Although the German professor enjoys a standing higher than in most other societies, education is not so consciously recognized as the ladder of social advancement. An academic training does not really fit a young person for the hardships of life, more cruel now than ever, and the memories of large-scale academic unemployment between the two world wars emphasize this subconscious bias. The situation is not helped by the fact that, in a heavily industrialized economy which is approaching the American structure to a large extent, the operator of a bulldozer takes home as much money as

most PhD's in physics. Little cooperation can be expected from the schools, which, particularly in rural areas, are highly decentralized, lack facilities, and are run very much in the old tracks as regards their attitudes toward higher education. In contrast, one cannot help but admire the American school bus system, which, even in remote areas, makes available adequate cultural and educational facilities.

One should be cautious about drawing any conclusions from such a small sample. If, however, some of the observations made on this short trip should reflect real changes in the whole system, physical research in German universities will recover eventually from its post-war "low" and will again play a more significant role. There will never be a return to the domineering position of German science in the twenties and early thirties. Science itself, and its interaction with the particular economic structure of which it is part, has changed too much in the last 25 years, but the German universities are aware of this change and seem to be engaged in a serious effort to eliminate some of their present shortcomings by adopting a more dynamic view of science. (B.O. Seraphin)

#### Royal Society Names Blackett

At its 305th anniversary dinner on 30 November the Royal Society elected P.M.S. Blackett as its new President, replacing Lord Florey, the incumbent for the past five years. The position is one of enormous power in England, because statutes stipulate that all appointments to Government research councils require prior consultation with the President of the Royal Society. Evidently a Nobel Prize is prerequisite to becoming President nowadays, and Blackett is no exception. His award was granted in 1948 for work in cosmic rays, rock magnetism, and atomic and nuclear physics. Specifically, together with G.P.S. Occhis ini (Nature 130, 363 (1932)) he developed a method of using counters above and below a Wilson cloud chamber to trigger the expansion of the chamber. Prior to this time, the expansion process was a hit or miss affair, with perhaps only 5% of all exposures taken revealing any particle tracks.

Lord Florey, Provost of Queen's College, Oxford, was made a member of the Nobility in 1945 for his work on penicillin. During his tenure of office, he made some attempts to encourage the election to the Royal Society of more engineers, social scientists and technologists, but all told such individuals still number little more than 5%. As in the US, it would be very difficult to elect a member of a professional group which presently has little or no representation in the organiza-

tion. Two years ago Sir Gordon Sutherland, an FRS himself and now Master of Emmanuel College, Cambridge, suggested that a Royal Society of Technology be formed, somewhat along the lines followed in the US. To date, there is little to suggest that such a development is in the offing.

In Lord Florey's valedictory he described some future needs for research in science and offered some speculations on the role of science in society. To relate population to environment optimally might be the greatest technological task of the remainder of the 20th century. Additionally, he described Britain's space effort as competent but "pathetically inadequate," and proposed instead a united program in underwater exploration and research. He also called for a greater unification of research efforts among many nations, thus following a trend already well developed in high energy nuclear physics. In his concluding remarks he questioned whether correct priorities were being given to Britain's fiscal expenditures, and he noted that, while Britain provides free medical treatment, there is insufficient funding of necessary basic medical research.

Concurring with Lord Florey, Blackett said that an essential step for raising the level of British science must be a frank assessment, by the scientists themselves, of the main research fields in a world context. As Professor of Physics at Imperial College, a WWI naval officer, and long-time advisor to the military (not always by their request), Blackett is well known for his speeches and writings on military defense. In the early days of the Institute for Strategic Studies he once addressed their annual conference to the effect that some of the American academic nuclear physicists were playing Russian roulette with electronic computers. In his opinion, the H-bomb is an absolute weapon and would demand an absolute enemy, thus rendering it unsuitable for any defense role.

Among other notables addressing the Royal Society dinner was the Prime Minister, who described his present policy of giving pure research in Great Britain "its head" and allowing it to flourish. He pointed with pride to the presence of an independent computer industry, a possibility which would have been seriously doubted only one year earlier. Mr. Wilson went on to state that in the fields of electronics and machine tools, his government intended to shoulder a similar responsibility; for the broadening of Britain's industrial base and the modernization of its industry, and hence its export market, would depend largely on the successful outcome of the government's support of basic research.

As a status symbol many scientists look upon the title FRS as being at least as prestigious as a knighthood. Thus it is of some interest to examine the dis-

tribution of FRS's among Britain's universities. Not surprisingly, London Univ., comprising as it does nine separate colleges (Imperial College, University College, Royal Holloway, Kings College, etc.), leads the list with 108 Fellows. Second on the list with 93 is Cambridge, followed by Oxford with 56. Edinburgh boasts 19, Liverpool 16, and Manchester and Bristol 13 each. It is perhaps surprising that Hull Univ. currently has no Fellows on its staff, although it is bigger than Reading, which has eight Fellows. As the educational program continues to expand, it is to be expected that the distribution of FRS's will continue to broaden, reflecting the continual reshuffling of personnel. Liverpool, for example, has more than doubled its number of FRS's in the past five years. (E.H. Weinberg)

#### PHYSICAL SCIENCES

##### A New Isochronocyclotron for the University of Hamburg

The First Institute for Experimental Physics of the University of Hamburg, Germany, under the direction of Prof. Dr. H. Neuert, is to receive a new 55-inch isochronocyclotron for variable particle energies with a beam deflection system.

The equipment has been ordered from Philips Industrie Elektronik GmbH, Hamburg. It should be operating in about 3 years. Financing of the whole project, including the buildings to house the instrument, is shared equally by the Federal Republic and the city of Hamburg.

The cyclotron is of most modern design, with spiral/sector focusing to obtain very high beam intensities. The magnet will weigh 80 tons and the pole diameter will be 1.40 meters. Particle energies can be regulated within fairly wide limits: 3-30 Mev for protons, 5-16 Mev for deuterons, 10-32 Mev for  $\alpha$ -particles.

The vacuum chamber, with a single D-electrode, offers enough space for internal experiments. It is hoped to reach beam currents of 1 mA. A special extraction system will permit a deflection rate of the ion beam at optimal setting of up to 90 percent. This will enable researchers to work with external targets at relatively high intensities outside the acceleration chamber.

The isochronocyclotron is to be used for nuclear reaction involving fast neutrons, which can be generated with high intensities because of the high beam-currents. Neutron spectroscopy will be carried out mainly by means of time-of-flight measurements utilizing the natural pulse of the beam current. Furthermore, the study of nuclear reactions with charged particles in order to check certain nuclear reaction models is planned. (VDI-Nachrichten #47/24 Nov. 1965) (D. Bartocha)

### Conference on Holograms and Diffraction

Under the chairmanship of Dr. H.H. Hopkins (Imperial College, London) the Optical Group held a one-day meeting on the above topic at the National Physical Laboratory on 4 November. Some 125 persons, perhaps one-third of whom are employed at NPL, attended this session, although few newsworthy items were reported.

J. Dyson, Superintendent of the NPL Light Division, opened the morning session by remarking that he had worked with Gabor since holography was born in 1947. At that time the purpose was to correct aberrations in electron microscopy, but shortly thereafter their best resolution of  $10 \text{ \AA}$  was improved by a factor of three without holography. Most biologists using electron microscopy seemed sufficiently satisfied at the time that no further attempts to improve significantly the resolution by this means seemed warranted.

Prof. D. Gabor (Imperial College) presented the first paper, entitled "The Basic Principles of Wavefront Reconstruction," a topic too well developed to require additional comment here. However, Gabor did offer some measure of the expanding interest in this topic, reviewing his own initial thinking at the age of 17 (in 1917) and concluding with the comment that the UK had invested some \$300,000 in lasers last year. Among the applications to which this sum was to be devoted, he listed the following: Fourier spectroscopy; three-dimensional, submicrosecond-exposure photography, with possible adaptation for use in bubble chambers; photographing through translucent materials such as frosted glass; various kinds of signal amplification; ultrasound; electron microscopy; X-rays; coding.

During his comments on X-rays, Gabor stated that he had made a thorough analysis of the possibility of X-ray holography and feels that it has a good chance of success, but he refused to answer any questions or expand further upon the subject. Under the topic of coding, Gabor referred to his article in the 30 Oct 1965 issue of Nature, entitled "Character Recognition by Holography," in which he indicates this possibility for computers and other data-processing devices. Gabor points out that presently a hologram is prepared by using a light source and an object. Later, when illuminated by the light source, the hologram again reveals the object. In principle, the reverse should be equally possible; i.e., if one produces a hologram made by combining some alphanumeric, such as the letter A or the number 6, with some combination of point sources as a code-word easily readable by a machine, then whenever the original letter or number, as originally illuminated, is presented to the hologram, the code-word will flash out.

Recognizing the ability of a photographic emulsion to store information in depth, Gabor went on to show how it is possible to make full use of the information capacity of fine-grain photographic plates. He concluded that a single plate may discriminate between all the numbers and letters of the alphabet, allowing each to have 30 possible variants!

Dr. J.M. Burch (NPL) gave the second paper, "Wavefront Reconstruction Interferometry." He pointed out the possibility of studying deformation through holography interferometry (cf. ESN 19-9), as well as the possibility of developing a mechanism for automatically comparing a large number of machined cylinders (for instance) against a master. He also suggested that suitable stroboscopic techniques might allow one to study, holographically, rapidly moving systems. During discussion of this paper, Dr. L.H. Tanner (Queen's Univ., Belfast) noted that it is now possible to attempt the visualization of all types of fluid flow parameters by means of holography.

In the third paper, "A Simple Treatment of the Boundary Wave Problem in Diffraction Theory," Hopkins reviewed his simplified approach to diffraction theory, apparently as he employs it to teach Kirchhoff theory at Imperial College. His discussion of the effect of a diffraction edge on the resulting illumination pattern was of some pedagogical interest.

Dr. C.L. Rogers (College of Advanced Technology, Birmingham) in his paper, "Recent Advances in Wavefront Reconstruction from Holograms," expanded upon Gabor's original comments, calling attention to the capacity of an  $8 \times 10$  photographic plate to store  $10^{11}$  bits of information. In fact, Rogers made the interesting remark that the success of laser holography today is due much more to the successful development of fine-grain film than of lasers. In commenting upon X-ray holography he took a rather dimmer view of this problem than Gabor, noting that quite wide photographic plates might be needed to record a suitable number of beats. While physicists are wont to make all their integrations from  $-\infty$  to  $+\infty$ , he remarked dryly that film of such dimensions may be more difficult to purchase!

Prof. C.A. Taylor (Univ. College of South Wales, Cardiff) then discussed "Diffraction Patterns of 'Randomly'-arranged Apertures." In this paper, by all odds the most interesting of the meeting, Taylor showed how optical diffraction patterns can serve as an analog in solving X-ray problems. Beginning with a general discussion of his work in X-ray diffraction in gases and liquids, he called attention to the inadequacy of

most textbooks, which claim that if one has a random arrangement of  $N$  diffractors, as might be assumed in a gas, an incoherent pattern should result. In actual fact, Rogers always finds a bright spot at the center of his pattern. (Stone, Radiation and Optics, McGraw-Hill (1963), however, does adequately cover this point on pp. 146 ff.)

The experiment which Taylor has been carrying out consists of punching holes in opaque discs in a number of regular or irregular arrangements, then comparing the optical laser diffraction pattern so obtained with that which he sees on his X-ray diffraction pictures. In this way, it is possible to infer something about the structure of those gases and liquids in which he is interested.

Beginning with a perfectly regular array, he obtains the standard textbook pattern. By moving the holes around only slightly, keeping their mean position the same, he can now duplicate thermal motion of the atoms for the corresponding X-ray case. By making more nearly random arrangements of holes, he can simulate a great variety of atomic and molecular distributions. In this way, he has obtained a large collection of highly interesting diffraction patterns, whose similarities and differences expand many times his ability to interpret X-ray patterns.

Mr. C.D. Reid (Atomic Weapons Research Establishment, Aldermaston) spoke on "Recognition Problems of Patterns with a High Content of Periodic Detail." The fingerprint identification work (also described in EIN-19-9) may be useful whenever fingerprint transparencies can be prepared, since it appears quite easy for a rotating-slit scanner to make rapid comparison of two holograms, one of which is of the known fingerprint and the other of a suspected one.

The last paper, "Nadar Holograms," was given by Mr. J.T. Christie (Royal Radar Establishment, Malvern), and it reviewed the work of Cutrona, Leith, Porcello and Vivian. This latter group presented a paper entitled "On the Application of Modern Optical Techniques to Radar Data Processing" to the 9th AGARD Symposium on Opto-Electronics in Paris in September 1965. Supported by several US Government contracts, including DA 28 043 AMC 0013, Cutrona et al. showed how it is possible to run film rapidly past a cathode-ray tube display obtained from a synthetic-aperture sideways-looking radar -- thus obtaining directly a hologram which, upon laser illumination, brings into optical view the scene earlier scanned from the airborne radar. RRE's work is aimed more at "keeping a hand in" than in making fundamental improvements in this technique.

Throughout the Conference it was evident that most of the holographic work reported is likewise directed at attempts to keep abreast of the large-scale American effort in this field. Many of the slides and data presented were credited to the Univ. of Michigan people, and much of the time was devoted to reporting on what US scientists had done rather than on new British experiments or proposals. (E.H. Weinberg)

#### Conference on Power Applications of Controllable Semiconductor Devices

This Conference, organized and sponsored by the Power Division of the Institution of Electrical Engineers, was held 10-11 November at Savoy Place, London. That the subject is one of widespread interest was evidenced by the fact that more than 540 participants enrolled and attendance was heavy at every session. Most of the delegates represented firms and laboratories in the UK, but about 40 people attended from overseas, representing Austria, Belgium, Canada, Czechoslovakia, Denmark, France, Hungary, Japan, the Netherlands, Norway, Poland, Spain, Sweden, Switzerland, and the US.

The thirty papers, which were presented by rapporteurs, were divided into three categories: devices, protection and gating circuits, and applications. These contributions are printed in Part 1 of the Conference publication, while the discussions held during the Conference were recorded and will be printed in Part 2. These publications are available from the Secretary, IEE, Savoy Place, London, WC 2, at the price of £3 (\$8.40) each.

Two papers were submitted from the USSR, but the authors did not attend the Conference. Mr. N. Kh. Sitnik of the Electrotechnics Research Institute of Saransk submitted a paper entitled "Power Thyristors and some Questions concerning their Use in Electrical Energy Transformers," and Mr. B.D. Kurnosov submitted a paper entitled "The Use of Thyristors for Excitation of High-Power Synchronous Machines." Four other foreign papers were contributed, three Swedish and one Danish.

Most of the papers were written with the term "applications" well in mind, and they form a broad survey of the properties of controllable semiconductor devices from the point of view of power application. There were papers devoted to the design of devices and to the problems of setting the controllable parameters so that a suitable selection of characteristics is obtained. Lifetime control, the reduction of electric fields at junction edges, the characteristics of a completed device and the assessments needed for its use

were considered. A five-layer switch which permits symmetrical switching was described by G.D. Bergman and R.D. Nott of Hirst Research Center. Sitnik, in the paper cited above, also included a discussion of five-layer structures and dealt with the advantages of symmetrical switching.

One group of papers was devoted to a discussion of the problems of protection arising in the industrial application of power thyristors. The advent of thyristors suitable for power application has created many new problems in the design and coordination of protection systems to meet prescribed classes of duty and foreseeable fault conditions. These problems arise from the fact that the characteristics of semiconductor devices differ so widely from the other main circuit components, such as transformers and machines. A much more exact approach to protection techniques is now necessary if maximum use is to be made of solid state devices, while at the same time ensuring the reliability demanded at an acceptable cost. One very interesting contribution in this area was made by Prof. Dr. Karl Lerstrup, Royal Technical College of Copenhagen, in a paper entitled "High Speed Fuses for the Protection of Diodes and Thyristors." Lerstrup emphasized the advantages gained through the use of fuses employing a multiplicity of short arcs, but he also pointed out many other aspects which must be considered when designing fuses. Other papers discussed application of devices in variable frequency control of ac machines, field control of ac synchronous machines, fixed-frequency sine-wave inverters and lighting controls.

A very lively discussion on terminology took place during the Conference. The consensus of opinion seemed to be that a better definition of the term "thyristor" is needed, and that a distinction must be made between unidirectional and bidirectional devices.

It was shown quite clearly that the problems affecting the power engineer using silicon-controlled rectifiers are quite different from those facing the electronics engineer using thyristors.

The thyristor has given to power engineering a new dimension of control and allows many well-tried pieces of hardware to move smoothly into the field of automation. (C.E. Barley)

#### IEE Colloquium on HS 303 (Early Bird) and the Post Office Earth Station at Goonhilly

This Colloquium was held at the Institution of Electrical Engineers, London on 1 November 1965, under the sponsorship of Professional Group E9 on Satellite Communications, Electronics Division, IEE. It was attended by about 300 persons, mostly British junior engineers but including several senior individuals involved in the UK space effort and engineers from the Raisting Station in Germany and Pleumeur-Bodou in France.

The seven papers presented constituted a rather didactic review of the design, con-

struction, and operational performance of the British General Post Office's comsat ground terminal at Goonhilly, Cornwall, England, in conjunction with the Early Bird satellite. The papers are to be published during the coming year. The discussion periods which followed each set of papers were interesting, at times lively, and shed some light on a few complex technical/political problems such as choice of future comsat orbits, time delay, intra-European cooperation, terminal size and the future of commercial comsat.

A paper by N. Stanesby, Assistant Engineer-in-Chief, General Post Office (GPO), reviewed the history of the Goonhilly terminal, with attention to the improvements made after use with Telstar and Relay to make it compatible with Early Bird. The latter operated at slant ranges of some 25,000 miles, four times the range of the low-altitude spacecraft, with correspondingly greater free-space attenuation. The operation frequencies of Early Bird are different and its tracking rate much slower than its predecessors. The gain and effective noise temperature of the 85-ft antenna have both been improved; transmitter power has been increased.

The three high-capacity European terminals in France, Germany and the UK assume, one after another, week-by-week "working," "stand-by," and "maintenance" roles for all of western Europe. The system is capable of providing 240 duplex telephone channels or two tv channels. About 70 telephone channels are now regularly employed.

A series of detailed papers covered the electrical design and performance and the mechanical construction of the Goonhilly antenna, and the design and performance of the low-noise receiver and the maser amplifier. Another paper covered the system characteristics, and a final paper described the European terrestrial interconnection network.

The discussion on types of satellite systems to come in the future was spirited. The GPO is reluctant to close the door on medium-altitude systems, but is designing its new antenna to track along the equatorial belt only (no polar orbits). Traditionally, GPO had taken a position dead-set against synchronous comsats because of the time-delay problem over the long path. This opposition now has obviously been largely melted away by the performance of Early Bird. Stanesby termed the time-delay effect "marginal." He referred to the extensive customer call-back tests now being made on transatlantic circuits; he believed that these tests would show the way to a final choice. The separate problem of echo suppression was dismissed quite quickly in discussion. The group felt that modern suppressors could handle this problem, and it was only necessary to press them into general use.

One problem pointed out by R.H. Franklin of GPO is that of pilot frequencies. Apparently, for various reasons, the US, UK, and the continental countries have each selected different pilot-marker frequencies. He termed this a "state of anarchy," and suggested that all countries get together within the comsat consortium to select a standard pilot frequency.

The relative merits of radomes came up for discussion. J.K.S. Jowett, also of GPO, reported no correlation of rain at Goonhilly with attenuation of received signal level. However, the Goonhilly station did measure a 3 db decrease in the received signal level when it was raining at Andover. The attenuation is blamed not on raindrops in the air but on water accumulated on the radome. It was concluded that, particularly where the weather is quite rainy, it is more efficient to use a radome even if heavier construction is required. (Presumably, then, it is better not to use a radome on a windy dry desert.)

The question of antenna size arose in discussion. Jowett felt that the 85-ft dishes now in use would be large enough for the foreseeable future. With the basic comsat system, which will be 10 db above HS 303, their 85-ft dish could provide as many as 960 40 kc channels. He felt that this will be satisfactory for a decade or more. On the other hand, no decrease in antenna size is to be anticipated, since 85 ft is essential to handle video and several supergroups of telephony.

Jowett also discussed the problems and techniques of multiple access in answer to a question, and pointed out that the difficulties being experienced now stem largely from the characteristics of HS 303. With future satellites, multiple access will be quite feasible with the use of linear amplifiers (no limiters) and 250mc bandwidth. He did point out, however (and rightly so) that, assuming the cost of the satellite(s) and the western terminal(s) as fixed, the per-channel costs will increase as the number of European earth terminals increases, even if multiple access were to allow for perfect efficiency in bandwidth use.

Several speakers took pains to laud the cooperative effort among the Goonhilly, Pleumeur Bodou, Rainting, and Fucino stations. A special point was made of the effectiveness with which they worked together, saving money for each country by not requiring back-up stations at each site.

Mr. J.H.H. Merriman, who is Deputy Engineer-in-Chief of the GPO, gave a short "pep talk" during the discussion; he made several points: (1) Communications satellite system work involves immense problems in international collaboration; (2) He is awed by the great technical progress made in the last few years, particularly evident

in the fact that microwave engineers are adding up fractions of a db in budgets which cover several orders of magnitude; (3) The UK and other countries owe a great deal to the US. Britain is pleased to have an eight-percent share in the International Consortium. They recognize that the US "freely, gladly and willingly" gave much of its expensively-gained technical information free to this consortium. The UK and other nations can step onto a plateau of advanced technology without having spent a penny on initial development. (B.I. Edelson)

#### Conference on Spectroscopic Studies of Vibrational Modes

This conference, which was held 29 Oct. at Queen Mary College, Univ. of London, consisted of seven invited addresses in which various aspects of the subject were reviewed. The theoretical background was discussed by Dr. R.J. Elliot (Oxford), who pointed out the basic principles underlying the following methods of determining vibrational modes in solids: (1) inelastic scattering of slow neutrons; (2) diffuse X-ray scattering; (3) multiphonon infrared absorption; (4) defect infrared absorption; and (5) Raman scattering.

The diffuse scattering of X-rays was discussed by Dr. T. Smith (Aberdeen), who showed how the diffuse X-ray intensities arising from inelastic scattering could be used to provide reliable information about certain branches of the phonon dispersion curves.

Studies of vibrations in liquids and solids by means of Raman scattering of light were discussed by Dr. D.A. Long (Swansea). The recent development of laser sources, which enables some experiments to be carried out much more easily, has furnished a valuable supplement to standard Raman techniques. Studies of the angular dependence and polarization of the radiation are now more feasible, and small samples and colored samples can now be investigated. An important example in this area is the study of a III-V compound semiconductor, which was carried out at the Royal Radar Establishment with the use of a He-Ne laser as a Raman source in the red. This enabled the exciting radiation to be at a frequency below the band gap energy. Both the first and second order Raman effects were observed.

Spectroscopic studies of the phonon spectrum of solid argon using impurity (krypton or xenon)-induced absorption were discussed by Prof. G.O. Jones (Queen Mary College). The resulting absorption is characteristic of the density of states of the lattice vibration spectrum. The data give remarkably good agreement with a calculation based on first principles.

Use of rare gases provides a particularly simple system. However, rather long path lengths (25 cm) are necessary, as the weak interaction among the atoms results in weak absorption in the 100-500 micron region.

A large number of spectroscopic studies of point defects in solids were discussed by Dr. J. White (Oxford); among the topics covered were: electronic spectra, spin resonance, infrared spectra, and neutron scattering. Two types of systems were used as examples: atoms in ions trapped in lattices of varying inertness, such as H atoms in rare gas matrices or hydride ions in calcium fluoride; and molecules trapped in lattices and cages, such as NO<sub>2</sub> in AgNO<sub>3</sub> or NH<sub>4</sub><sup>+</sup> ions in zeolites. The following three classes of properties of the defect center were discussed: (1) static properties, such as the delocalization of the electron wave function; (2) the "localized" vibrational modes of the atom or molecule; and (3) the coupling between the molecular and lattice motions.

Prof. E.W.J. Mitchell (Reading) discussed the interaction of phonons with electronic spectra. The talk dealt largely with the optical analogue of the Mössbauer effect. Many electronic spectra of defects in alkali halides, diamond, and zinc sulphide contain relatively sharp lines, which are attributed to zero-phonon electronic transition, and also a fine structure involving both electronic and vibrational transitions. Maxima in the absorption can be associated with singularities in the density of states, and reasonable agreement can be obtained for the zone boundary frequencies determined by this and other methods. There are a few low-frequency transitions whose origin is not yet understood.

The dynamics of liquids as revealed by thermal neutron scattering was discussed by Dr. P.A. Egelstaff (Harwell). A good summary of his material is contained in the book "Thermal Neutron Scattering," edited by Egelstaff and published on the day of the Conference. Liquids are in many ways much more complicated than solids. However, in the past few years there have been significant advances in the theoretical understanding and experimental techniques for studying the microscopic behavior of liquids. The basic treatment through correlation functions and expressions for some macroscopic constants (e.g., diffusion and viscosity coefficients) in terms of the microscopic correlation functions was outlined. Much useful work remains to be carried out in this area.  
(M. Hass, U.S. Naval Research Laboratory)

## PSYCHOLOGICAL SCIENCES

### Second International Conference on Applied Military Psychology

Representatives of military psychology programs in Belgium, Denmark, France, UK, Israel, the Netherlands, Norway and the US met in London during the week of 20-24 September for the Second International Conference on Applied Military Psychology. The Conference, hosted by the London Branch Office of ONR, served as a means for increasing information exchange in the area of military psychology.

The meeting was patterned after one held at the Naval Medical Research Institute, Bethesda, in 1963. The program was organized so as to encourage maximum interaction among the participants with a minimum of formality. In fact, a fundamental goal of the Conference was to provide an opportunity for unstructured discussion, which normally is not available at international professional meetings. The focus of the meeting was on problems of research methodology in military psychology, and three broad topic areas served as the basis for discussion -- selection, psychosocial problems of military personnel, and criteria of effective military performance. The agenda was developed through almost a full year's exchange of correspondence between prospective delegates from the various countries invited to participate.

In order to encourage informality, no papers were read during the Conference and no formal presentations were made. Moreover, attendance was rigidly limited to a maximum of two full-time psychologists from in-service research organizations of each participating country. Prior to the meeting, participants prepared position papers reflecting their thoughts, past experiences, and possible future strategies in each of the three major topic areas. These papers were distributed in advance and served as background information for the discussions.

Despite the fact that many of the participants were unacquainted at the outset of the Conference, the five days were characterized by an almost continuous flow of rather intense and highly focused discussion. When translation problems arose (the discussions were held in a highly unsystematic mixture of English and French), the whole group joined in to provide proper interpretations or shades of meaning. All participants were proficient in at least one of these languages and possessed a tolerable knowledge of the other. Thus, rather than constituting a barrier to

communication, the lack of formal translation services appeared to enhance group cohesiveness and interaction.

The discussion on selection was limited to methodologies other than the classical paper-and-pencil approaches to aptitudes and abilities. Differences in orientation between countries with universal military conscription and those with voluntary services were considered along with the implications of such differences. Generally, there appeared to be a fairly uniform agreement as to the desirability of re-evaluating or reconsidering the potential of non-cognitive, personality, and motivational measures. There also was considerable interest in the potential of sequential or serial, as opposed to one-time, selection techniques.

The topic of psychosocial problems of military personnel probably evoked the most lively and difficult-to-terminate discussions. It soon became apparent that most of the participating countries are becoming increasingly interested in the broad area of social psychology. While many problem areas were touched upon in the papers prepared in advance of the meeting, the actual discussion rather quickly focused upon two topics: leadership training and problems of recruiting and retaining military personnel. An extensive range of conceptual and methodological approaches to leadership training were presented, although, as might be anticipated, there was also an almost total lack of attempts to evaluate systematically the effectiveness of these techniques. The obstacle here appeared to be the problem of criterion rather than a failure to appreciate the need for such research. The discussion on recruiting and retention centered around questions of attitudes toward the military and the service image. One of the most striking aspects of the whole Conference was the similarity of the results obtained from surveys of attitudes toward military service in the various nations.

The criterion problem in military psychology has been such an old standby at professional meetings that one might expect this topic to elicit little enthusiasm. However, such was not the case here, and a rather sophisticated and broad perspective was taken in approaching this topic. The need to adopt a multiple-criteria approach to military performance was rapidly agreed upon, and the remainder of the discussion was devoted to various strategies useful in defining and developing such criteria. Again, one could not help being rather struck with the similarity of reasoning and research strategy which had developed quite independently in the various countries.

No effort was made to reach formal agreement on any specific points of the agenda or to suggest a single "best" strategy for dealing with the problems which were discussed.

The discussions were not recorded, and no formal records were kept of the meeting; however, the major points developed during the Conference were summarized on the last afternoon for the benefit of the participants. Because of the informality of the meeting it was agreed that no public report would be compiled.

In summary, the Conference consisted of a full week of intensive interaction and stimulating discussion (with an occasional polite argument) among individuals with highly similar professional problems and interests. The participants had both the time and opportunity to expound fully their own positions and to explore those of others; and they had many of their conceptual and methodological approaches to current problems in military psychology either reinforced or -- in some cases -- somewhat battered by their peers. In retrospect it would appear that the goals of the Conference were wholly fulfilled.  
(J.E. Rasmussen)

#### Supply and Training of Educational Psychologists in England and Wales

A ten-member working party convened by the Department of Education and Science is currently reviewing the role and supply of educational psychologists in England and Wales. Chaired by Prof. Arthur Summerfield of Birkbeck College (Univ. of London), the group's purpose is "... to consider the field of work of educational psychologists employed by local education authorities and the qualification and training necessary; to estimate the number of psychologists required; and to make recommendations." The report that will ultimately be produced will be reviewed by the Secretary of State and may well have an important impact on the future of educational psychology in the geographic areas covered. At present, the working party is considering the comments and suggestions of interested organizations and individuals. Substantial numbers of groups and individuals have already submitted "memoranda of evidence," and their reports are beginning to receive publicity in the local press. There appears to be clear agreement that educational psychologists are in critically short supply.

One such report, for example, that has recently been released is that of the National Union of Teachers (NUT). This points out that approximately 300 educational psychologists are now in service. One thousand are currently needed to meet the psychologist-pupil ratios of one to six thousand in rural areas and one to ten thousand in urban areas, which have been proposed by the British Psychological Society.

The NUT sees the ideal role of the educational psychologist as teacher, clinician and adviser or promoter. In the first of these roles, the activities range from advising teachers on the broadly clinical and remedial work associated with clinical disorders and various manifestations of psychopathology to less serious problems of emotional maladjustment which may be caused by or arise from educational difficulty. Both classes of clinical problems are, of course, here profound influences on the learning process. In the case of serious behavioral disorders, the teacher expects the psychologist to make a preliminary diagnosis and to determine whether psychiatric or medical assistance is required. Less fundamental problems are attacked either by specific remedial action or by advice to the teacher on the nature of the problem. Little more than "first aid" is offered under the present conditions of acute shortage.

Promotional activities also suffer from the shortage. With adequate manpower, these would include appraisal of new educational techniques (e.g., programmed instruction); consultation on statistical analysis; participation as a member of a team which assesses the needs of students with educational difficulties for special remedial treatment; participation in child guidance programs; and in the preparation of detailed registers of children which would include relevant aptitude, achievement and clinical information.

With respect to training, the report urges no lowering of standards in the face of the short supply of educational psychologists. Adequate qualification in both psychology and education is considered necessary, with emphasis on practical experience in teaching, particularly at the primary level and in the field of special education.

(J.A. Nagay)

#### Second Annual C. H. Myers Lecture, "Personality and Experimental Psychology"

The second Myers Memorial Lecture, sponsored by the Council of the British Psychological Society, was presented at the Univ. of Birmingham on 24 November. Entitled, "Personality and Experimental Psychology," the lecture was given by Prof. H.J. Eysenck (Univ. of London). The full text will be published in the Bulletin of the British Psychological Society.

Eysenck's lecture dealt with what he perceives to be one of the fundamental obstacles to the proper development of scientific psychology. Its root is in the neglect of individual differences by experimental psychologists and, conversely, in the failure of personality theorists to pay adequate attention to the findings of the experimentalists. He developed this thesis

by citing examples from the experimental literature which show how neglect of individual differences, i.e., their relegation to the error term of the analysis of variance, frequently results in failure to demonstrate any significant effects. Then, however, subjects are grouped on the basis of some objectively measured personality dimension, experimental results are clarified and the effects become apparent. Thus, with proper typological consideration, significant relationships (leading in opposite directions for different sub-groups) can often be demonstrated, on the other hand, disregard of typological differences could obscure the effect of the independent upon the dependent variable.

The lack of rapprochement between personality theorists and experimental psychologists has had other undesirable effects. Eysenck suggested that uncorrelated exemplars of theories are often made. Thus when significant data effects are found they are based on means, and have little predictive value for the individual case. Whole systems of theory and interpretation have been built up on the basis of results obtained with one type of subject (male or female), and these might not survive replication on other subject types. The concept of disease of "schisms of personality," often lacking in theoretical rigor or factual support, can be described in this state of affairs.

The ideal viewpoint probably lies between the extremes of those who are dedicated to the search for general laws of human behavior and of those who declare that no such laws exist. Eysenck suggested that experimentalists should sample the typologies offered them by personality theorists, and that personality theorists should, in turn, attempt to integrate experimental findings and theories with their own concepts. Without doubt, designs will become more complex, research more time-consuming and expensive, and background knowledge more extensive and less idiosyncratic, but psychology has no choice but to accept additional burdens if it is serious in its quest.

(J.A. Nagay)

#### RESEARCH NEWS

The German, Austrian, and Swiss Chemical Societies, or rather their divisions for analytical chemistry, plan to hold a joint meeting 11-13 April 1966 in Linde, Badense (West Germany), Germany.

The main subjects to be discussed are: Automated analytical methods, trace analysis and its application limits, and the combination of analytical procedures for structure analysis. Authors planning

to present papers should register them by 15 January 1966. The necessary forms and further information may be obtained from: GDCH - Geschäftsstelle, Postfach 9075, Frankfurt-am-Main, German Federal Republic. (B. Bartocha)

#### What Price Prestige?

You can buy a British title but it won't get you a seat in the House of Lords. Whether it will even be a status symbol is a little doubtful. It might, however, get you a considerable amount of official paper and perhaps a little gold leaf.

The London Times reports an auction sale in Colchester on 1 December, at which 15 lordships changed hands at an average of £628 apiece. A Lordship of the Manor, such as one of these, carries no direct land holding but usually "extensive manorial records, going back in some cases to the fifteenth century, and there was always the possibility of wayleaves and rentals."

What the purchasers wanted to do with their acquisitions was in some cases unclear. In one case it was to be given to a museum. One wonders if it is really worth £600 to encumber oneself with the title of, for example, "Lord of the Manor of Surlingham Earls cum Little Breech." (N.W. Rakestraw)

#### What About Meat?

I have referred on previous occasions to the preoccupation of the British with their food habits. A few recent examples of this have appeared. The first of these was a lecture by Dr. J.G. Davies before the Royal Society of Arts on "The Food Industry in 2000." His premise was that the most important problem in nutrition, both present and future, is the supply of animal protein. He held out the prospect that by 2000 AD the sophisticated investigations of the food chemists will have led us to know all that it is necessary to know about nutrition. The "snag," as he called it, would be monotony. Animals, bred to become bigger and more proteinaceous, would become more and more alike, until the steaks carved off them fail to arouse gusto in the palate of the epicure. And this despite the various "additives" which the future will no doubt bring forth. The ultimate result, he surmises, will be the appearance of a new specialist, the nutritional psychiatrist to treat nervous breakdowns brought on by the succession of breakfasts, dinners and suppers which look and taste alike, notwithstanding their embellishmen. with all the best and latest chemicals.

A possible deterrent to this grim prospect is to be seen in the work of Mr. N.W.

Pirie, of the Biochemistry Department of the Rothamstead Experimental Station, who has been improving methods for protein extraction from leaves and grasses. A machine squeezes the foliage into a pulp and finally delivers an uninviting green mass of protein. This can be freeze-dried and stored indefinitely, tasting faintly like tea, a property which can, if desired, be overcome by the disguising flavors of fruits or vegetables. Mr. Pirie admits that meat is certainly tastier than leaf protein, but we may of course wonder how people will think about this in 2000 AD, in view of Dr. Davis' warning. Among the presently available additions to our menu, however, are such delicacies as onion, mustard and pea-pod leaf-protein pie, vegetable hot pot with wheat leaf protein, and barley leaf protein soup.

As may be surmised, the existence of better things to eat has led to some resistance to these innovations, but who knows about the future? As matters stand now, the leaf proteins are relegated to the protein-hungry, undeveloped regions of the world where, in Indian and Uganda for example, machines of the Rothamstead type are even now grinding out tea-flavored meat substitutes.

Another report bearing upon the food supply is one from the port of Great Yarmouth, where the last of the 50 Scottish herring boats are preparing to go home after a season with the lowest herring catch on record, nearly 60% less than last year's, which held the previous low record. Undaunted, the fishermen say they will try again next year. After all, fish are a useful source of animal protein.

On the other hand, bad news is accompanied by good, for the Potato Marketing Board has just announced that the available stocks of potatoes have increased over those of last year by more than 600,000 pounds. As anyone knows who orders a meal in Britain, potatoes are a large item of the local diet, but the epicure will scarcely welcome their substitution for meat -- however monotonous -- pickled herring, or even (perhaps?) "vegetable hot pot with wheat leaf protein." (N.W. Rakestraw)

#### Personal News

Andrew Stratton, presently head of a research group in the Weapons Department at the Royal Aircraft Establishment, Farnborough, has been appointed Professor and Head of the Dept. of Mathematics at the College of Aeronautics.

Prof. Sir Owen Saunders, FRS, is relinquishing from 1 Jan 1966 the headship of the Dept. of Mechanical Engineering at Imperial College of Science and Technology, to devote more time to research. Prof. Hugh Ford,

Prof. of Applied Mechanics, will succeed him. Saunders will remain as Professor of Mechanical Engineering of the College.

Dr. E.W. Horien, Senior Lecturer in Physiology, St. Bartholomew's Hospital Medical College, has been appointed to the Wellcome Chair of Pharmacology at the School of Pharmacy, Univ. of London.

Dr. J.T. Sauerl, Senior Principal Scientific Officer at the National Physical Laboratory, has been appointed to the Chair of Theoretical Fluid Mechanics at the Imperial College of Science and Technology, London.

Dr. A. Legg, Senior Lecturer in Geology, has been given the title of Deputy Director of the Sedimentology Research Laboratory. Prof. P. Allen is nominated Director.

A. Kirk, Senior Lecturer in Numerical Analysis, has been appointed Director of the Computer Laboratory at the Univ. of Liverpool.

Dr. R.C. Jennison, Senior Lecturer in Physics, Manchester Univ., has been appointed Professor of Physical Electronics at the Univ. of Kent.

Dr. R.R. Baldwin, Reader in Physical Chemistry, has been appointed to the second Chair of Chemistry at the Univ. of Hull.

Dr. D.A. Long, Reader in Physical Chemistry at the University College of Swansea, has been appointed Professor of Structural Chemistry at Bradford Institute of Technology.

Dr. M.W. Roberts, Lecturer in Physical Chemistry in the Dept. of Chemistry, The Queen's University of Belfast, has been appointed Prof. of Physical Chemistry at Bradford Institute of Technology.

Lionel Bramble, Editor of Nature, has died in London at the age of 61.

#### TECHNICAL REPORTS OF ONRL

The following reports have recently been issued by ONRL. Copies may be obtained gratis by Defense Dept. and other US Government personnel, ONR contractors, and other American scientists who have a legitimate interest. However, because of the frequent content of proprietary and prepublication information, the reports cannot be sent to libraries or to citizens of foreign countries. Requests for ONRL reports should be addressed to: Commanding Officer, Office of Naval Research Branch Office, Box 39, Fleet Post Office, New York, New York 09610.

ONRL-51-65 Some Biophysics Facilities in Sweden by E.A. Edelsack (ONR San Francisco)

ONRL-52-65 Some Solid State Research at the Royal Radar Establishment, Great Malvern by B.O. Seraphin

ONRL-53-65 MHD Research at the Institute for High Temperature Research (TH, Stuttgart) by E.L. Murphy

ONRL-54-65 Lasers in the UK, Part I: The Royal Radar Establishment (RRE) Great Malvern, Worcestershire by E.H. Weinberg

ONRL-55-65 The International Center of Theoretical Physics in Trieste by J.M. Jauch (Univ. of Geneva)

ONRL-56-65 Research on Fatigue and Fracture of Steel at the Ship Structure Research Laboratory and The Metal Institute TNO, Delft, Netherlands by W.S. Pellini

ONRL-57-65 Mathematics in Northern and Southern Ireland by B. Epstein

ONRL-58-65 Lasers in the UK. Part II. Services Electronics Research Laboratory, Baldoak by E.H. Weinberg

ONRL-59-65 Inorganic Chemistry in Scandinavia by S.Y. Tyree

ONRL-60-65 Nuclear Physics Centers in Belgium and The Netherlands by J.G. Brennan

The following conference reports and directory are releasable to European scientists:

ONRL-D-11 Directory of Solid State Scientists in Western Europe: Part I, United Kingdom and Eire by B.O. Seraphin

ONRL-C-26-65 2nd International Congress for Research in Burns, Edinburgh, Scotland, 20-24 Sept. 1965 by C.H. Miller

ONRL-C-27-65 Ninth Conference of the Western European Association for Aviation Psychology, The Hague, Netherlands, 7-10 Sept. 1965 by J.A. Nagay

ONRL-C-28-65 CACR Symposium on Atmospheric Chemistry, Circulation and Aerosols Held at Visby, Sweden, August 18-20, 1965 by N.W. Rakestraw

The staff of ONR London  
extend to all readers of ESN  
their best wishes for the holi-  
day season and the new year.

Prepared by the Scientific Staff  
Submitted by P. King



W.W. SCHAEFER  
Captain, U.S. Navy  
Commanding Officer

## SUBJECT INDEX FOR VOLUME 10, ESN ISSUES 1 THROUGH 12, 1966

Articles are listed chronologically under subject heading with title, author, and issue page number. Thus, 4:54 indicates issue 4, page 54 of Volume 10.

<b>ACOUSTICS</b>		
Acoustics Meeting at Salford	4:66	Romm
Fifth International Congress on Acoustics	10:176	Romm
London Meeting on Concert Hall Acoustics	2:30	Romm
New Documentation Center for Ultrasonics	2:31	Romm
Report on the Formation of the British Acoustical Society	4:67	Romm
Sonar Used As Telemetry Link in Underwater Seismological Study	3:44	Romm
<b>AERODYNAMICS</b>		
Aeronautical Engineering at Cranfield	1:1	Corcos
<b>BIOLOGY</b>		
Atomic-Powered Desalination	7:109	Rakenstraw
Atmospheric Carbon Dioxide	3:39	Rakenstraw
Biological Research at the National Institute of Oceanography	2:20	Cronin
Cheese	9:152	Rakenstraw
Fish Farming	10:166	Rakenstraw
New Director for Plymouth Marine Laboratory	1:3	Cronin
Whither Turns the Worm?	9:152	Rakenstraw
<b>CHEMISTRY</b>		
Brunel College	8:130	Tyree
Chemical Seminars in Britain	4:59	Bartocha
Chemistry Division of AWRE, Aldermaston	4:59	Cooper
Conference on Chemisorption and Catalysis	2:23	Bartocha
Conference on Polymer Synthesis and Properties	4:60	Bartocha
15th Annual Meeting of the International Committee on Electrochemical Thermodynamics and Kinetics	2:27	White
4th International Symposium on Batteries	2:27	White
International Symposium on Fuel Cell Research	7:112	Bartocha
A New Chemistry Building in Bristol	1:8	Bartocha
SAC Conference - Nottingham	8:131	Tyree
<b>COMPUTERS</b>		
Autonomics at NPL	2:31	Blackman
Instituto Nacional de Electronica	1:14	Blackman
<b>DENTISTRY</b>		
Clinical Meeting of the 2nd International Conference on Oral Surgery	8:124	Meyers
Dental Degrees in the UK	5:75	Meyers
Some Dental Research Reported at the Meeting of the British Division of the International Association for Dental Research	5:73	Meyers
<b>EARTH SCIENCES</b>		
Kiel Lighthouse	12:210	Rakenstraw
The Upper Mantle of the Earth	5:77	Henn
Water Pollution Research	11:167	Hennett
<b>ELECTRONICS</b>		
Conference on Electronics Design	3:48	Barley
Conference on Power Applications of Controllable Semiconductor Devices	12:217	Barley
IRE Colloquium on MSZ (Early Bird) and the Post Office Earth Station at Goonhilly	12:218	Edelson
Symposium on Microwave Application of Semiconductors	8:145	Barley
Third Symposium on Photoelectronic Image Devices as Aids to Scientific Observation	10:175	Kron
<b>HEALTH PHYSICS</b>		
Civil Defense in Norway	6:100	Cooper
Improved Film Badge Dosimeters	4:59	Miller

MATHEMATICS

Centenary Meeting of London Mathematical Society	8:133	Epstein
National Computing Center for UK	12:210	Epstein
The New University of Sussex	4:62	Epstein
Symposium on Random Process Analyses	8:135	Ross
University of Newcastle-upon-Tyne	12:210	Epstein

MECHANICS

A Contribution to the Dynamics of Boundary Layer Transition	5:79	Corcos
Fluid Mechanics at the University of Liverpool	4:60	Corcos
How to Teach the Art of Approximation	6:93	Corcos
Lubrication Research at Leeds	1:2	Corcos

MEDICINE

Eye Infections Explained	12:206	Miller
Further Report on Ultrasonics as a Diagnostic Tool in Medicine	1:4	Ross
Hungry? Have a "Proteinburger!"	3:40	Miller
Measurement in Therapeutic Assessment	5:73	Miller
Medical School of the University of Hong Kong	12:207	Gemmill
Medical Ultrasonics International	9:152	Ross
Medicine in French-Speaking West Africa	3:41	Miller
Natural Selection and Transmissible Disease	7:110	Miller
The Pahlavi University at Shiraz, Iran	8:125	Gemmill
Respiratory Virus Infections of Man and Animals	6:89	Miller
Parasites and Disease	12:205	Miller
Royal Naval Symposium on Naval Medicine	4:58	Miller
Second International Conference on Protozoology	8:125	Miller
Second International Symposium on Inhaled Particles and Vapours	12:204	Miller
Symposium on Clinical Effects of Interaction between Drugs	5:72	Miller
22nd Meeting of the NATO AGARD Aerospace Medical Panel	11:187	Dunn
Wellcome Historical Medical Library	12:208	Gemmill

METALLURGY

Committee on Structural Steels	11:190	Pellini
--------------------------------	--------	---------

MILITARY SCIENCE

International Congress of Navigation	9:160	Barley
--------------------------------------	-------	--------

MISCELLANEOUS

Academician's Lecture on Soviet Science	3:44	Epstein
Autonomics Laboratory of the National Physical Laboratory	4:67	King
Bed Ticking	9:156	Weinberg
Beer!	11:194	Rakestraw
Expansion of Swiss Technical University	10:168	Epstein
Four German Universities Re-visited	12:211	Seraphin
High and Dry and Why	8:136	Rakestraw
How About a Tombstone?	8:136	Rakestraw
A New American College in England	7:12	Rakestraw
Presidential Address of Sir Cyril Henshelwood to BAAS	9:156	Epstein
Royal Society Names Blackett	12:214	Weinberg
Scientific Activities at Trinity College, Dublin	8:145	Cooper
Scientific Instrumentation in Israel	1:5	Maternann
Scientist Exchange Program	1:5	King
Tale of a Yak	12:203	Rakestraw
Tip to London Tourists	4:54	Rakestraw
"Tour de Texas"	7:112	Rakestraw
University College, London	3:43	Rakestraw
The University of Nottingham	11:192	Tyree
Water!	11:189	Rakestraw
What About British Food Habits?	10:169	Rakestraw

NUCLEAR PHYSICS

Accelerator Development at CSF	5:81	Cooper
Allgemeine Elektrisch-Gesellschaft Forschungs Institut, Frankfurt am Main	2:28	Cooper
The Casaccia Center of Nuclear Studies, Rome	7:115	Cooper
DESY and the Institute of Physics at the University of Hamburg	7:116	Cooper
Experimental Low Energy Physics at the Bohr Institute	6:99	Cooper
International Conference on Elementary Particles	10:172	Brennan
International Neutron Physics Conference	8:140	Brennan
The Junta Energia Nuclear (JEN), Madrid	2:28	Cooper

Low Energy Nuclear Physics at AWRE and AERE	4:04	ESN-10-12
Medium Energy Nuclear Physics at Univ. of Birmingham	0:07	Cooper
A New Isochronocyclotron for the University of Hamburg	12:210	Cooper
Nuclear Energy Section of Fiat, Turin	0:100	Bartoche
Nuclear Physics and Chemistry and Radiobiology at the Weizmann Institute of Nuclear Science		Cooper
Nuclear Physics at Oxford University	7:117	Cooper
Nuclear Energy Section at the Institute "Boris Kidric," Belgrade	3:49	Cooper
Nuclear Sciences Research at Centre d'Etudes Nucléaires de Grenoble - Non-Reactor Type	7:116	Cooper
Particle Storage Rings	0:08	Cooper
Research in Atomic Defence at the Norwegian Defense Research Establishment (Forvarets Forskningsinstitutt FFI)	0:04	Cooper
Some Observations on the Status of Research in Physics, Cambridge University	0:08	Cooper
Swiss Federal Institute of Reactor Research, Wurenlingen	2:29	Cooper
Training Reactor	7:114	Cooper
	7:118	Rakentraw
<b>OCEANOGRAPHY AND MARINE BIOLOGY</b>		
Biological Research Relating to the Delta Plan of Holland	9:150	Cronin
Britannia Rules What Waves?	9:153	Rakentraw
Comments on Oceanography in Italy	12:200	Rakentraw
The Commercial Oceanology Study Group	12:208	Rakentraw
Contact Meeting on Marine Radioactivity	0:100	Cronin
Department of Oceanography, Univ. of Southampton	8:120	Rakentraw
The Development of Oceanography in Scandinavia	0:153	Rakentraw
Estuarine Research in Great Britain	0:01	Cronin
Hot Spot Gets Hotter	0:103	Rakentraw
Institut für Meereskunde, Kiel	8:128	Rakentraw
Living Fibers and Sediment Transport	3:39	Cronin
Marine Biology Program of UNESCO	3:40	Cronin
The Mid-Atlantic Ridge	4:50	Rakentraw
New Marine Developments in Wales	0:78	Rakentraw
New Organizational Control of Oceanography in Britain	8:120	Rakentraw
Nordic Council for Marine Biology - 1965	0:79	Cronin
Oceanography in Ireland?	10:100	Rakentraw
Ocean Survey Ship Launched	4:58	Kelley
Pogonophora Are Needed from the North Atlantic	8:120	Cronin
Some Activity in Marine Geophysics at Cambridge University	8:130	Rakentraw
Some Doings at NIO	4:54	Rakentraw
Sonar to the Rescue!	7:106	Rakentraw
The Sub-Bottom Seismic Structure of the Gulf of La Spezia	1:14	Kelley
Symposium on Radioactivity	11:188	Rakentraw
A Voice for British Oceanography	12:200	Rakentraw
<b>OPTICS, INFRARED AND SPECTROSCOPY</b>		
Conference on Optics in Space, Univ. of Southampton, 27-29 September 1965	11:104	Weinberg
<b>PSYCHOLOGY</b>		
French and Swedish Acousticians Aid the Deaf	0:101	Ross
Human Factors Information Retrieval Program at Warren Spring Laboratory	2:35	Rasmussen
Maternal Behavior of Mice Attributed to Ultrasonic Cries of the Young	0:52	Ross
Medical Research Council Applied Psychology Research Unit, Cambridge, England	0:83	Rasmussen
Meeting on Quantitative Aspects of Hearing	0:101	Ross and Nagay
New Graduate Training Program in Psychology, University of Sheffield	9:104	Nagay
Programmed Instruction in the British European Airways	0:102	Nagay
Royal Society Meeting on Ritualization of Behavior	7:118	Nagay
Second Annual C.S. Myers Lecture "Personality and Experimental Psychology"	12:222	Nagay
Second International Conference on Applied Military Psychology	12:220	Rasmussen
Supply and Training of Educational Psychologists in England and Wales	12:221	Nagay

**PHYSICS**

AGARD Meeting on Fundamental Studies of Ions and Plasmas Artificial Ion-Cloud Research at the Institute for Extraterrestrial Physics, Garching	10:172	Balwanz
Bristol Solid State Conference	9:160	Murphy
Conference on Atomic Spectra and Radiation Processes (Oxford 12-14 April 1965)	2:32	Zemel
Conference on Holograms and Diffraction	2:35	Murphy
Conference on Spectroscopic Studies of Vibrational Modes	12:216	Weinberg
Direct Electricity Generation from Ionized Vapors and Flames	12:219	Hass
Effect of Excited Levels on the Relaxation Length for Production of Non-equilibrium Ionization in an MHD-Channel (Program at the TH, Stuttgart)	1:10	Murphy
Inaugural Lecture of Prof. K. Stewartson, Univ. College, London	11:198	Murphy
An Instant Tin Detector	3:42	Murphy
Institute for Applied Electronics, Trondheim, Norway	4:64	Rakestraw
Institut für Plasmaphysik (IPP) at Garching	9:163	Murphy
Interferometry Without Much Interference	10:178	Murphy
Lasers Come in Handy at AWRE	9:159	Weinberg
International Colloquium on The Optical Properties and Electronic Structure of Metals and Alloys	9:159	Weinberg
Lasers Here and There	10:169	Seraphin
Lasers in the News	11:196	Weinberg
Lecture by Chandrasekhar on "Post-Newtonian Equations of Hydrodynamics"	10:177	Weinberg
Lecture by Halton on the Einstein Archives	7:113	Murphy
Lecture by Hoyle and Narlikar on "New Theories of Gravitation"	8:122	Murphy
Microwave Cavity Measurements of Ionized Wakes at ISL, France	8:142	Murphy
Noise Reduction Exhibit in London	2:33	Murphy
Reassessment at Saclay in Plans for 40-Kgauss Magnet for MHD Conversion	7:114	Ross
Recent Argon/Cesium-Seeded Plasma Conductivity Measurements at Saclay	3:46	Murphy
Research on Combustion Chambers for MHD Power Conversion at Brown, Boveri and Co. Ltd. (Baden, Switzerland)	3:46	Murphy
Rocket-Borne Experiments to Investigate E-Region Ionization The Sand Man	10:181	Murphy
Summary of Laboratories in the German Federal Republic with Research Programs in MHD Electrical Power Generation	4:63	Murphy
Symposium on Molecular Relaxation Processes	9:157	Weinberg
	11:197	Murphy
	8:137	Brennan
<b>PHYSIOLOGY AND PHARMACOLOGY</b>		
Meeting of the Physiological Society	12:206	Peiss
Twenty-third International Congress of Physiological Sciences	12:207	Gemmill
<b>RADIOBIOLOGY</b>		
The Agricultural Research Council (ARC) Radiobiological Research Laboratory	4:66	Cooper
The British Home Office and Civil Defense Radiological Institute, University of Freiburg	1:8	Cooper
Radiobiology at the Laboratoire Pasteur, Institut du Radium, Paris	7:111	Cooper
Radiological Defense Section of Admiralty Research Laboratory, Teddington	6:90	Cooper
Radiotherapy at Cambridge	1:9	Cooper
Radiotherapy at St. Thomas Hospital, London	2:22	Cooper
Use of Protons in Radiobiology at Gustav Werners Institut, Univ. of Uppsala, Sweden	2:26	Cooper
Centralized Statistical Services	6:90	Cooper
	4:63	Cronin