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Edited by Bernard Epstein and Victoria S. Hewitson

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BIOLOGICAL SCIENCES

Vive la Couleur!

A tempest has been stirred up in France over the possibility of polluting the Côte d'Azur. A company which manufactures aluminum proposes to conduct the waste matter of this operation into the Mediterranean, at a point north of Marseilles, through a pipeline carrying it down to a depth of 1000 feet. It would be deposited on the slopes of the Cassidaigne Trench, which extends down to a total depth of 6500 feet.

There is strong opposition to the proposal. The solid waste matter is reddish in color, from the iron oxide in the original aluminum mineral, bauxite. There is a frantic fear that it may boil up to the surface, changing the color pattern of the Côte d'Azur and causing an exodus of fish and tourists from the region. Expert opinion is to the contrary; there is no evidence of strong currents in the Cassidaigne Trench, and it is deep enough to provide waste storage for hundreds of years.

It is hard to appreciate the magnitude of the ocean. What is proposed is scarcely more than throwing a pebble into a pond. The amount of waste matter naturally carried by rivers into the Mediterranean is vastly more than this. A member of the Académie Française, M. Jean Rostand, complained: "Let us not make a sewage dump of our sea." A very good idea, but the ocean is already a "sewage dump." Rotting, decomposition, and putrefaction go on in the sea as a part of the continual cycle of life and death. Nature has a wonderful way of cleaning herself up. The nasty messes we plant in the earth bloom as daisies in the spring. In the sea there are more living creatures than on the land, and they all die and decay, one way or another.

Still, this does not excuse needless and careless excesses. Pollution is a very real problem, particularly in restricted areas. The present case at least draws attention to it. Let us approach the problem rationally and unemotionally.
(N.W. Rakestraw)

Russians To Drill the Crust

The Russians have announced that they will drill a four-mile hole in the earth's crust. This project is to be complementary to the Mohole, but the Russians think (of course) that it will be more practical.

The purpose of this drilling will be to penetrate to the basaltic layer, which forms the lower part of the crust. The boundary between the first and second layers of the crust is ordinarily too deep for practical drilling, often between 7 and 12 miles, but near the edges of the continents it is generally less. The Kola Peninsula seems to be a suitable location, and a survey this year will locate an actual site. Drilling is expected to begin next year.
(N.W. Rakestraw)

Underwater Technology in Britain

Interest seems to be picking up in Britain in what we are calling in the US "ocean engineering" or "underwater technology." In addition to the Commercial Oceanology Study Group, which was reported recently (ESN-19-12, p. 208), a group has been gathered together in the shadow of the House of Commons under the leadership of Dr. Wyndham Davies, Conservative M.P. for Perry Bar, Birmingham. It is proposed to organize a British Society for the Promotion of Underwater Technology "to help the development of British oceanographic work." Others involved in this movement are: Lord Wakefield, Capt. W.O. Shelford, Dr. T. Gaskell (British Petroleum), Dr. A.S. Laughton (NIO), Mr. R.O. Odams and Cdr. P. White, RN, Superintendent of Diving. Among the subjects they plan to consider are: underwater archaeology, medicine, engineering and technology, communications, electronics, and particularly the provision of underwater research vessels and the need for the Ministry of Technology to take action.
(N.W. Rakestraw)

Not A Thing To Worry About

Anyone who saw "The Thing" when it appeared on the American screen and television a year or so ago will raise his eyebrows at an item in the London Times:

"Council officials were trying today to find a cure for a mysterious fungus which has taken root inside 500 houses in the London overspill town of Houghton Regis, Bedfordshire ... Some tenants have had to move out of their bedrooms and sleep downstairs."

Wondering (in reminiscence) whether the British Army will be called out to combat an extraterrestrial menace, one reads further, only to be disillusioned at the end of the column:

"The trouble appears to be caused by condensation and we are carrying out experiments in insulation at 20 houses to find a cure."
(N.W. Rakestraw)

Antarctic Research

A recently published statement by Dr. G. de Q. Robin, Director of the Scott Polar Research Institute, brings to light a matter of some interest. There may be many non-environmental scientists who are unaware of the nature and extent of Antarctic research. Why is this field important? If for no other reason, merely because this is one of the last frontiers of the world, still largely unexplored. Furthermore, as the statement points out, it is well known that the Antarctic continent is the world's largest storage reservoir for ice (along with Greenland), and if only a quarter of this were to melt, the world's sea level would rise 50 feet. Not that this is likely to happen soon, although such changes in sea level have apparently taken place in the past. Still, our knowledge of the physics of ice behavior, and other glaciological problems, is too limited to serve as a basis of prediction. We know that the average depth of the ice cover is some two kilometers, but we are not sure how stable it is.

It would throw light upon other biological questions if we could learn whether the concentrated plant and animal population of the Antarctic sea is the result of factors leading to high productivity or of greater resistance and longevity of the organisms. Efforts to answer such questions will be important in the biological program of the International Council of Scientific Unions (ICSU).

Some of the problems of meteorology, theoretical and practical, have their focus in Antarctica, where a network of reporting stations could facilitate prediction. The content of carbon dioxide in the Antarctic atmosphere is almost completely constant.

The discovery of open-water lakes and of coal deposits raises interesting questions, particularly in the latter case, which is related to theories of polar and continental wandering.

Research in Antarctica has been going on at an undiminished rate ever since the International Geophysical Year in 1956-57. High-altitude atmospheric research, including auroral phenomena for example, was important during this period. This program led to the formation of the Scientific Committee for Antarctic Research (SCAR), a subcommittee of ICSU. On this committee are representatives of all the countries which have had expeditions or activities in the region. The original 12 of these are: Australia, Argentina, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, the UK, the US and the USSR. More recently Denmark, Poland and Czechoslovakia have been added.

Closely related to the formation of SCAR is the Antarctic Treaty of 1959, the intergovernmental agreement by which all territorial claims are put into cold storage for 30 years. The continent shall not be used for military purposes, scientific research shall be encouraged and the results freely exchanged, and all stations shall be open to inspection and to scientists and observers of other countries. The treaty is a precedent in international cooperation, as was the IGY.
(N.W. Rakestraw)

Division of the North Sea

The British and Danish governments have agreed to divide the North Sea. A line has been drawn, roughly in the center of the Sea between the two coasts, to separate their respective future explorations for gas or oil or for any other purpose. They have promised to reach agreement on the exploitation of any geological structure crossing the line.

This agreement is in keeping with the Geneva Convention on the Continental Shelf, which went into effect in June 1964, and follows similar agreements made last year with Norway and the Netherlands.
(N.W. Rakestraw)

International Colloquium on Leptospirosis, Antwerp

An International Colloquium on Leptospirosis was held at the Prince Leopold Institute of Tropical Medicine, Antwerp, Belgium, 3-5 Dec 1965.

The familiar pattern prevailed of an opening academic session followed by four half-day sessions relating to the Colloquium's topic.

Prof. Dr. J. Mortelmans (Prince Leopold Inst.) read "Zoo-sociology, or Considerations on the Origins of Animal Husbandry" at the academic session. Following the introduction of the Colloquium topic by Prof. Dr. J. van Riel (Prince Leopold Inst.), 22 papers were presented, and

Prof. Dr. B. Babudieri (Istituto Superiore di Sanitá, Rome) concluded with a brief summary of papers read during the Colloquium.

The scientific papers considered taxonomy and classification, fine structure, serology and immunology, and biochemistry of the Leptospira, as well as the epidemiology and therapy of leptospirosis.

An ONRL report summarizing the conference will be distributed in the near future, and the formal proceedings should be available by early December, 1966, from the Prince Leopold Institute of Tropical Medicine, 155 rue Nationale, Antwerp, Belgium.
(C.H. Miller)

December Meeting of the Physiological Society

The December meeting of The Physiological Society was held at the Nuffield Institute of Comparative Medicine, London, 10-11 December 1965. Twelve demonstrations and 21 communications were presented, some of which are reviewed briefly below.

In recent years behavioral studies have been made in several laboratories in which Octopus vulgaris has been used successfully as the experimental animal. Many of these experiments have involved the use of a food reward. H.J. Coates, R.E. Hussey and M. Nixon (Anatomy Dept., Univ. College, London) demonstrated an ingenious automatic food dispenser which should prove to be most useful in behavioral studies of this kind. The apparatus consists of a series of plexiglass tubes containing the food reward, each of which can be tripped sequentially by a solenoid-operated trip bar. The entire apparatus is mounted on the lid of a sea-water tank, except for a stainless steel rod which extends into the tank and which can be raised or lowered by a motor. A stimulus consisting of a white plastic rectangle is attached to the end of the stainless steel rod. When the octopus pulls on the stimulus, the solenoid is activated, triggering inversion of one of the feed tubes and delivering its contents into the tank. The motor which returns the stimulus rod to its original position can be immobilized for any period between 15 seconds and 3 minutes by a resetting timer. Output signals can be recorded from a switch attached to the stimulus, indicating that the stimulus has been pulled, and from the feed mechanism, indicating that food has been delivered.

Two demonstrations were given by K. Copeland and J.T. Dobbin (Biophysics Dept., Univ. College, London). The first was of a source follower incorporating an insulated-gate field-effect transistor (Mullard 95BFY). This unit is a four-terminal transistor with characteristics similar to those of a vacuum tube. The four terminals are: substrate; source and drain (cathode and anode of vacuum tube); and the gate, which is an aluminum electrode placed between the source and drain and insulated from them and from the substrate. Input impedance can be as high as 10^6 megohms, and gate-leakage current is very low. As in conventional cathode-followers, the gain of the source-follwer cannot exceed one. The second demonstration was of a solid-state, high-input impedance, differential direct-coupled preamplifier, using two insulated gate field-effect transistors in the input stage. A Mullard 2N929 transistor formed part of the common source load. The second stage consisted of two Texas Instrument 2S003 transistors, the collectors of which deliver signals through a dividing resistor network to an emitter-follower stage consisting of two Texas Instrument 2S003 transistors.

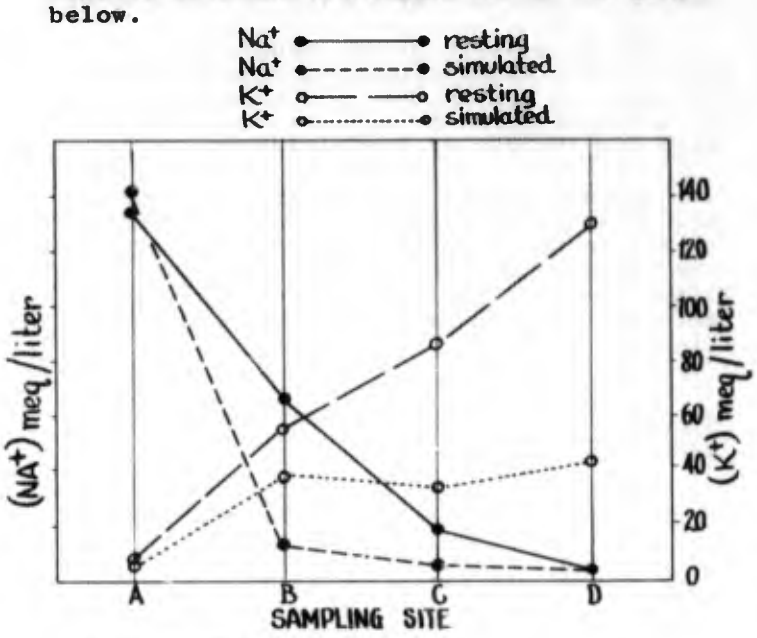
G. DuBoulay and R.N. Fiennes (Diagnostic Radiology Dept., St. Bartholomew's Hospital, London) demonstrated techniques for visual observation of blood flow patterns in the rabbit vena cava. In animals anesthetized with Nembutal, injections of contrast medium (Triosil) were made either into the femoral vein or directly into the inferior vena cava. Two recording techniques were used. In one, the contrast medium was monitored by television fluoroscopy and a cine film was made simultaneously at a speed of 25 feet/second. The second method involved a rapid-sequence cut-film serial-changer, which provided large radiographic pictures. It was found that the blood flow in the inferior vena cava is rhythmic, and slows during inspiration. Blood flow tends to be maximal at the end of expiration. In some cases, flow actually ceases at the end of inspiration, with retrograde flow into abdominal branches of the vena cava. This phenomenon appears to be due to kinking of the vena cava by the descending diaphragm. Rhythmic blood flow was also observed in the superior vena cava, but with opposite phase relations to respiratory movements. Because of these opposed effects, total right atrial return tended to remain relatively constant. The significance of these findings is somewhat difficult to assess, especially since the blood flows cannot be quantitated. The observation that the descending diaphragm physically obstructs the inferior vena cava is of potential importance. It remains to be seen, however, whether the same phenomenon occurs in unanesthetized animals, in which circulating blood-volume and cardiac output is much greater.

Two interesting papers were presented dealing with the effects of monoamines on body temperature. Several years ago Feldberg and Myers had shown that intracerebral injection of catecholamines in the cat lowered body temperature, while injection of 5-hydroxytryptamine elevated it. Exactly opposite effects had been observed in rabbits with these amines by Cooper et al. At this meeting D.J. Allen and E. Marley (Institute of Psychiatry,

Maudsley Hospital, London) essentially confirmed the findings of Feldberg and Myers in experiments on unanesthetized chickens. In these studies the amine injections were given intravenously. Recordings were made of core and surface temperatures and, on some occasions, electrocortical activity. Core and surface temperatures were lowered by 1 to 4° C in young chickens after administration of adrenaline (0.1 micrograms/kg), noradrenaline (0.5 micrograms/kg) and alpha-methyl noradrenaline (2.5 to 10 micrograms/kg). The fall in body temperatures was long-lasting (up to two hours) and was accompanied by deep sleep. Intravenous tryptamine or 5-hydroxytryptamine either had no effect or resulted in a transient fall in body temperature, except in chickens which had been pretreated with amine oxidase inhibitors. In these animals tryptamine and 5-hydroxytryptamine caused a long-lasting 2° C rise in temperature. It was concluded that the action of these amines is consistent with the hypothesis that there are two groups of amines having different mechanisms of action in the central nervous sytem.

W. Feldberg, R.F. Hellon and R.D. Myers (National Institute for Medical Research, London) showed that the body-temperature response resulting from monoamine injection into the cerebral ventricles in cats also occurs in the anesthetized dog. In these experiments the injections were made when the dogs were recovering spontaneously from the fall in body temperature caused by the anesthesia. At the time of injection the animals exhibited shivering. Injection of adrenaline or noradrenaline into the lateral cerebral ventricle caused suppression of shivering, reduction in muscle tone, vasodilatation in the ears and a fall in body temperature. These catecholamines appear to have two mechanisms whereby a lowering of body temperature is achieved. With smaller doses of these amines, heat production is decreased (suppression of shivering and muscle tone). At higher doses, heat dissipation is increased (peripheral vasodilatation). Injections of 5-hydroxytryptamine into these dogs caused vigorous shivering and increased the rate of recovery of body temperature from the fall caused by the anesthesia. Hyperthermia resulted when 5-hydroxytryptamine was administered to animals which had already recovered to normal body temperature.

E. Schögel and J.A. Young (Physiological Institute, Free University, Berlin) reported their experiments on sodium and potassium transport in the rat submaxillary gland. Samples of saliva were collected from glass microcapillaries or fine polyethylene catheters from the intercalated ducts, and from the upper, middle and lower portions of the main ducts. Sampling was carried out during resting flow and after stimulation of salivary secretion with pilocarpine. The unstimulated flow rate was less than 0.3×10^{-6} cc/min/mg gland wt. Flow rate after pilocarpine administration increased more than 100-fold to 30×10^{-6} cc/min/mg gland wt. The results obtained are summarized in the graph below.



A: intercalated duct
B: upper main duct
C: middle main duct
D: lower main duct

These data indicate a significant reabsorption of sodium during the passage of saliva along the submaxillary-gland duct system. The effect of pilocarpine appears to be an enhancement of sodium reabsorption in the smaller ducts distal to the upper main duct. Some of the increased sodium reabsorption could also be attributed to decreased water permeability in this part of the duct system in response to pilocarpine. Potassium concentrations in the resting state rose almost linearly as the saliva moved along the duct system. After pilocarpine, however, potassium concentration did not change significantly during the passage of the saliva along the length of the main ducts. Studies on electrolyte flux rates, in which the main duct was perfused with Ringer's solution containing inulin-C^{14}, indicated that the electrolyte composition of the final saliva could be accounted for by the measured flux rates in the resting gland.
(C.N. Peiss)

MATERIAL SCIENCES

Inorganic Chemistry at Liège

The University of Liège sprawls in about 30 different places over the entire city. Plans are well underway to relocate the entire University on a wooded hill just outside the city (pop. approx. 500,000), but the realization is well into the future.

There are presently about 120 full professors, including three in chemistry. G. Duyckaerts is Professor of Analytical Chemistry, and he also supervises the work in inorganic chemistry. All chemical facilities are located in the Institute of Chemistry and Metallurgy, rue Armand Stevart, 2. About 15 PhD's work under Duyckaerts' supervision, some as faculty members with teaching obligations and some as senior research fellows supported by a substantial grant from Euratom for fundamental research in actinide chemistry. A considerable effort in the physical chemistry of the actinide elements is in evidence. F. Caligara is in charge of a group studying the behavior of the actinides in fused alkali halide melts, using polarography and coulometry as the principal techniques. However, a Cary 14h spectrophotometer has just been received, and spectrophotometric work in the fused salt melts will be started immediately. Adequate facilities are available for the preparation and sampling of anhydrous chlorides of the actinides and various halometallate salts. Emphasis has been on uranium salts, such as UCl_4 and Cs_2UCl_6, in efforts to devise micromethods which can be extended to analogous Np and Pu chemistry. A Phillips X-ray powder camera has been modified to permit observation of powder patterns of microgram samples at high temperatures.

The kinetics of electrochemical reduction of U^{4+} in molten (Li,K)Cl are being studied, with varying Li-K ratio. Dr. J. Fuger has just finished building a microcalorimeter with which heats of solution of several actinide halides will be measured. In this research, an excellent example of cooperation is to be found between Duyckaerts' group in Liège and Nagnall's group at Harwell. The latter group has the Np and the know-how to make very pure chlorides, but no microcalorimeter. Thus, they will prepare $NpCl_3$ and send samples for heat-of-solution measurements to Fuger.

Other research interests in Duyckaerts' department are the determination of equilibrium formation constants of $SbCl_3$- acetophenone by use of precision infrared and Raman spectroscopy and metal-ion extraction into solvents, e.g. toluene, using trilaurylamine hydrochloride as the extractant.
(S.T. Tyree)

MATHEMATICAL SCIENCES

Examination of Papers of G.N. Watson

The Royal Society, which issues each year a volume of obituaries -- actually, critical evaluations -- of its deceased members, has assigned Prof. J.M. Whittaker, FRS, to prepare the memorial for the eminent mathematician G.N. Watson, who died 2 February 1965. This assignment is particularly appropriate, since Watson's career was closely linked with that of Whittaker's eminent father, Sir E.T. Whittaker. After the latter's "Course of Modern Analysis" first appeared in 1902, it was expanded, largely by Watson, and to this day "Whittaker and Watson" remains a bible of classical analysis. In his own right, Watson is justly esteemed for his monumental treatise on Bessel functions as well as for a large and substantial number of research publications.

Whittaker, who retired last year from the vice-chancellorship (presidency) of the University of Sheffield, has been awarded a post of "Senior Fellow" at the University of Birmingham, where Watson spent the major part (1918-1951) of his mathematical career. (The new building which houses Birmingham's Departments of Pure Mathematics, Mathematical Physics, and Probability and Statistics is named in Watson's honor.) This post will enable him to make a careful study of the large mass of papers which Watson accumulated at his home in the nearby town of Leamington Spa. At this point it appears doubtful that any unpublished mathematical researches will be discovered, but this possibility cannot be ruled out; furthermore, there appears to be a substantial record of Watson's correspondence with the brilliant Indian mathematician Ramanujan.

Whittaker expects to complete his study of Watson's papers within the next few months and to submit the obituary to the Royal Society in June. He then looks forward to a resumption of his mathematical researches, which were almost completely abandoned during his thirteen-year tenure of the vice-chancellorship at Sheffield. He had previously held the chair of mathematics at the University of Liverpool.
(B. Epstein)

Probability and Statistics at Sheffield

Britain's universities contain perhaps six active centers of probability and statistics, a subject in which further expansion is urgently needed. The most exciting and promising recent development would appear to be that at the Univ. of Sheffield. Last September the chair of probability and statistics was accepted by J. Gani, who has previously held positions in Australia and at Michigan State University. He has already succeeded in bringing to Sheffield a substantial number of graduate students as well as young post-doctoral research workers who also participate in an active teaching program.

The most striking impressions which this visitor gained were of the great enthusiasm and of the highly international flavor of the staff. The lecturing staff contains several Australians (C.C. Heyde, G.F.W. Yeo, S. Lipton, B. Wessakul) and several Indians (V.K. Rohatgi, T.N. Bhargava,

K.R.P. Parthasarathy). Among the graduate students are a number of Americans and Australians; through his close contacts with Michigan State and the Australian National University, Gani hopes to maintain an active exchange of students and faculty members.

Gani is also heavily involved as editor of the Journal of Applied Probability, which he founded in 1964 after an arduous effort to raise the necessary financial support. An account of this effort will be found in the October 1965 issue of The American Statistician.

Gani's chair is maintained by, and named for, the United Steel Companies. British industry has been notoriously remiss in supporting the nation's universities, and its action in establishing this chair is one of the more significant indications that a change in attitude may be developing.

Briefer visits to Sheffield's departments of Pure Mathematics and Applied Mathematics also made a very favorable impression on this reporter. The former Department is headed by the distinguished Prof. D.G. Northcott, FRS (noted for his researches in ideal theory and homological algebra). Among the senior members of his department may be mentioned L. Mirsky (linear algebra) and H. Burkill (intergration, almost-periodic functions). The Department of Applied Mathematics is led by Prof. D.N. de G. Allen (numerical methods, structural analysis). A second chair in this Department has just been occupied by the very young and capable P.C. Kendall (mathematical problems of geophysics and ionospheric physics), who has made a number of visits to the High Altitude Laboratory in Boulder, Colorado. This Department operates the University's Computing Laboratory (D.J. Evans, Director). (B. Epstein)

MISCELLANEOUS

The Technical Faculty - A New Experiment in Higher Education (Not new for us - but somewhat revolutionary for Germany)

Anyone reading the German scientific literature in the fields of mathematics, physics or chemistry will have noticed that in the area of fundamental, non-technical research the output of the German universities is almost balanced by the amount of equally basic results reported from the institutes of the German Technische Hochschule. (I.e., Technical College. The literal translation "Technical High School" is entirely misleading.) The character and quality of their research work seems to be somewhat out of tune with the adjective "technical" in front of their name. A visit to their laboratories confirms this impression. In the faculties which comprise the exact sciences, the institutes of the Technische Hochschule have developed to a stage where there is hardly any difference from similar institutes at the universities. A physicist graduated from a Technische Hochschule receives approximately the same education in his major field as a graduate from the university.

We shall not speculate on the reasons which have forced the Technische Hochschule in this direction. The fact that this development up to now represented a one-way street, however, which was never entered from the other direction, places particular interest on an experiment which tries to reverse this old trend: the re-orientation and expansion of an existing "pure" university in the direction of a Technische Hochschule by adoption of a "Technical Faculty."

German universities developed over the centuries in the traditional framework of academic freedom. This tradition is more or less a heritage common to most European countries. That it had a particularly strong development in Germany can possibly be explained by the German tendency to elevate "principles" to the status of "Weltanschauung" by making them part of a coherent philosophy and by the assumption that academic freedom provided the basis for the early success of German research, which was performed almost exclusively at the universities during the time when this research was at its peak.

This educational philosophy placed entirely on the shoulders of the student the responsibility for the planning of his studies. He had to select his courses, was privileged to attend lectures in any combination of subjects or degree of difficulty (or no lectures at all), and he could change universities frequently. The university's responsibility was limited to stimulating independent thought in the student and to preparing him for the further pursuit of knowledge. The final examination was a duty imposed on the university by the State, which sought to satisfy the nation's need for well-trained experts.

It was this conflict between the idealistic educational philosophy of the universities and the practical purpose which the State expected them, as institutions for the training of much-needed experts, to fulfil that led to the foundation of the Technische Hochschule in the second half of the last century. Opposing the traditional view that only arts and sciences in the "pure" form were appropriate for university study and that anything "practical" must be excluded, the Technische Hochschule differs from the universities not so much in the choice of subject as in the method of teaching. Free from many of

the influences that were part of the university tradition, the Technische Hochschule has gone much further towards planning study courses and setting up curricula and attendance requirements to which the students are expected to conform. This freedom from tradition considerably decreases the tremendous inertia which has always made the adaptation to modern needs so particularly difficult for German universities.

It was the Technische Hochschule, however, which was forced to change its course first. The technical and scientific revolution which started approximately 50 years ago raised the requirements for a type of training which could previously be considered strictly practical and technical. Scientific results were exploited technically to an ever increasing extent, the period of transition from science to technology grew shorter and shorter, and scientific methods penetrated more and more technical procedures. At an increasing rate, situations arose which required from the engineer experience in scientific methods and familiarity with rather fundamental subjects.

The Technische Hochschule adapted to these new requirements in an admirable manner, with the result that in mathematics, physics and chemistry there is hardly any difference between their courses and those in the universities, as described in the first paragraph.

This is not enough, however. In the last twenty years, a new gap has become more and more conspicuous and may possibly not be bridged by the joining of scientific disciplines to technical faculties. Technology no longer seems to be in need of the support which the old-style university could give. It is the other way around: technology has penetrated to a great extent the intellectual, moral and spiritual values for which only the university used to be responsible. Thus, the university can no longer neglect the existence of technology and its impact upon the humanitarian background of people. Technology is so much a part of our culture that the university as the guardian of the cultural heritage of mankind can no longer bypass it.

From an American point of view, all this sounds a little bit like "beating a dead horse;" however, from the standpoint of German academic tradition, it is revolutionary. So revolutionary that German official reports on the subject come right out and say that projects of this type could never be realized in existing universities, but that the assimilation of technical faculties will be possible only in the new universities (Report of the Wissenschaftrasrat, 1960).

In spite of this discouraging statement, one of the 18 German universities decided to give it a try. Approximately three years ago in Erlangen/Bavaria, a project was begun which had as its objective the addition of a "Technical Faculty" to the existing seven faculties. It was emphasized right at the beginning that this should not result in just adding a small-scale Technische Hochschule to the University. The real value of the enterprise is seen in the interaction between the hitherto separated branches of education, "... to open the mind of the student of technology to the full spectrum of the intellectual world, and to permit the student of the classical faculties an insight into the methods, the problems and the importance of technological activities," to cite an official publication on the subject.

The new faculty is based on the three basic sciences: mathematics, physics, and chemistry. In the mathematical branch, two "chairs" will be devoted to the modern aspects of data processing. A computer center will be included in this branch, but will be available for the data processing needs of the other faculties of the University. Growing out of the background of physics is the electrical engineering branch, with five chairs. The third and largest branch of the new faculty is devoted to materials science, with six chairs specializing in metals, ceramics, plastics and in the mechanical, electrical and magnetic properties of materials. Two further chairs of this branch will be devoted to the technical aspects of chemistry. The function of the chair for "constructive design" is to familiarize the young engineer with the general viewpoints pertinent to the design and production of technical devices. Since it will be difficult to find a member of the academic community for this chair, it is planned to invite speakers from the top echelons of industry to give guest lectures on a rotating basis.

The new faculty is planned to accommodate 600 to 800 students. On 64 acres in a forest south of the city of Erlangen, buildings are being constructed which, after completion, will represent an investment of $25 million. Of the seventeen chairs, nine are already occupied. and negotiations are under way to fill the rest. The first lectures started last summer.

With its strong emphasis on interdisciplinary contact and interaction and on teamwork without regard to the boundaries of faculties and specialties, this new faculty could overcome the traditional vertical structure, one of the severe handicaps of the German university. If successful, it may succeed in training engineers who, in contact with both science and art, will have acquired a broader view of their field. (B.O. Seraphin)

Lowering of the Flags

In accordance with an Instruction recently issued by the Defense Council, the use of flag semaphore signals will be discontinued by the British Navy. Flag signals were first introduced into the Navy in 1886.

The older, wooden-arm semaphore, invented by Admiral Sir Home Popham, consisted of an upright and two movable arms. A short overland communication line, using this device, was set up in 1816. Its use was expanded until, in 1845, messages were being flashed from the Admiralty, in Whitehall, to Portsmouth in seven minutes, through 11 intermediary stations. These semaphores were first seen on shipboard in 1853, six years after their discontinuance on land, where they had been displaced by the more rapid and effective electric telegraph. They were not used permanently on ships, however, until 1876, and were later displaced by the flags.

And now the flags, too, are a casualty to progress, abandoned for the new electronic techniques and other modern means of communication.
(N.W. Rakestraw)

British Engineering

Observers sometimes feel that Britain is not developing its technological capabilities to the maximum. The Joint Parliamentary Secretary of the Ministry of Technology, Mr. Richard Marsh, admitted this in a recent speech at the Brunel College of Advanced Technology. He maintained, however, that this was not due to a lack of new inventions and techniques, but rather to a failure to use those already available. He said:

"I doubt whether it is possible, or even desirable, to spend a very much larger share of our national resources on scientific research. We shall never be in a position to match the efforts of the United States."

He deplored the "snobbery" in Britain, where the social status of the engineer is lower than in any other comparable industrial country. In support of his claim that British technologists are as good as any, he cited the development in this country of hydrostatic extrusion, nuclear reactors, and Hovercraft.
(N.W. Rakestraw)

Place Your Bets!

An indoor sport of great prestige in Britain is the pursuit of Lady Luck. "Licensed Betting Offices" are not quite as common as London pubs. Horses and football attract the most customers, and although I haven't run across the numbers game I suppose it exists.

In view of all this, the plight of the Oxford undergraduate is indeed a sorry one. The proctors have forbidden all Oxford students to gamble at the new casino recently opened on Banbury Road. The Senior Proctor, Dr. C.M. Yardley, says the reasons for this injunction are: (1) time spent in the casino is likely to be at the expense of a student's studies; (2) public funds (with which most students are in part supported) should not be put in jeopardy; (3) the University should not, on moral grounds, condone and encourage such pastime.

The first of these reasons reminds us of our misspent youth in the poolrooms of older days; the second seems inconsequential in view of the precarious stability of all public funds, in Britain if not elsewhere; and the last appears hypocritical if it is the purpose of education to prepare youth for life in the modern world.

Nevertheless, the casino is off limits; other attractions will have to suffice.
(N.W. Rakestraw)

Dedication of Space Physics Center in Tel Aviv

On 16 February 1966 the Saul Kaplun Institute for Applied Mathematics and Space Physics was dedicated in a brief ceremony held at Tel Aviv University. This Institute, which will consist of the two departments of the University named in the title, is named in memory of the Caltech aerodynamicist who died two years ago at the age of 39. The prompt establishment of the Institute has been made possible by gifts totalling about $700,000.

Brief addresses by Israeli academic and political dignitaries and the US Ambassador, Mr. Walworth Barbour, were followed by a guest lecture presented by Prof. P. Lagerstrom of Caltech, who described Kaplun's scientific development from student to valued colleague.

The precise nature of the Institute's activities still awaits clarification. This writer was assured during a visit, which fortunately occurred on the date of the dedication, that no attempt will be made to engage in activities which are beyond the resources of this small (but incredibly knowledgeable and gifted) nation.

The Department of Space Physics is headed by A. Sapir, who earned his doctorate at UCLA, while S. Abarbanel, an American who took his doctorate at MIT, has assumed the chairmanship of the Department of Applied Mathematics.
(B. Epstein)

PHYSICAL SCIENCES

Industrial Unit at Royal Radar Establishment

The Ministries of Aviation and Technology have announced plans for an "industrial systems unit" to be set up at the Royal Radar Establishment. RRE is one of the largest research establishments of the Ministry of Aviation, and employs about 2500 people. According to reports, the plans are designed to assure that the results of research secure a wider and more rapid application in industry. Development contracts necessary to encourage industrial application will be placed by the Ministry of Technology, which will be represented on the R and D board of the Ministry of Aviation and on appropriate sub-committees. The names of personnel to be assigned to the new industrial unit at RRE have not been announced.

RRE has broad research responsibilities for the application of electronics to equipment for the three fighting services and for civil aviation. Responsibilities are confined to radar and quasi-radar systems; responsibilities for naval applications are confined to airborne installations. In addition to concepts of military and civil systems, fields currently covered by RRE include fundamental work in the study of the physics of materials and techniques which may prove to be applicable to electronics. The experimental program of the RRE comprises the establishment of fundamental techniques and such further work as is necessary to demonstrate that a new technique has potential capability. Equipment development, as such, is largely carried out by industry.
(M.W. Long)

Annual Meeting of the Israel Physical Society

The Israel Physical Society is a rather loose organization to which, in principle, all physicists in Israel may belong. Since the Society collects no dues and has no specific entrance requirements, membership of the 350 physicists presently residing in Israel is practically automatic. After a period of greater activity, including unsuccessful attempts to maintain publication of a bulletin as a vehicle for research notes, the only current function of the Society is the convocation of an annual meeting for the discussion of professional problems and for the presentation of invited and contributed technical papers.

Last year's meeting took place at Bar-Ilan University in Ramat Gan, near Tel Aviv, 23-24 December. Most prominent of the 125 participants was P.A.M. Dirac, who was one of the invited speakers. Other invited papers were given by Y. Ne'eman (of Ω^- fame), now at Tel Aviv University, and J.M. Blatt of the University of New South Wales, Australia, presently Visiting Professor at the Weizmann Institute in Rehovot. While none of these speakers divulged radically new information, their talks were very interesting and beautifully presented.

The climax of the meeting was without doubt Dirac's talk entitled "Quantum Electrodynamics without Dead Wood." Although his ideas on this subject have been published recently (Phys. Rev. 139, B 684, 1965) and an expanded version is in preparation, I would like to try to summarize briefly the essential points of Dirac's talk for a wider audience. It has been known for many years that all attempts to obtain a relativistically correct solution of the Schrödinger equation for cases involving charged particles interacting with the electromagnetic field have encountered fundamental difficulties. While the electromagnetic forces between the particles and the field are perfectly understood and the Hamiltonian can be constructed without difficulties, one cannot solve the Schrödinger equation containing this Hamiltonian even approximately for the physical states that one is interested in. One cannot even find a solution for the vacuum state, trivial as this case may appear to be.

The accepted method of dealing with this problem is to treat the interaction between the field and the particles as a small perturbation and to look for a solution in form of a power series. Unfortunately, one obtains a series of divergent integrals. To get results allowing comparison with observable quantities, a set of "working rules" has been devised according to which the disturbing infinities are removed in a well-prescribed manner and only finite quantities are permitted to remain. In this way very important results, such as the Lamb shift and the anomalous magnetic moment of the electron, have been obtained and been found to be in good agreement with experiments.

Dirac, however, feels that the replacement of logical deduction by a set of working rules is too high a price to pay for this success. He proposes instead to abandon the Schrödinger form of quantum mechanics for problems involving the interaction of charged particles with the electromagnetic field and to use in its place the Heisenberg form which, in his opinion and contrary to the view of most physicists, is not completely equivalent to the Schrödinger form. In applying the Heisenberg picture, there is no need to refer to the vacuum states in order to obtain physically significant solutions; one can avoid the vacuum states altogether (the "dead wood" in the title of the lecture) by using the operators for electron emission and annihilation for the calculation of the interaction between the particles and the electromagnetic field. In this way, the objectionable infinities associated with the vacuum states disappear and the remaining terms are only logarithmic in the interaction energy. While these,

in principle, may go to infinity, they remain small enough if we restrict the calculations to "small energies," say 10^8 eV. Within this limitation these terms can be cut off without violating the fundamental principle of logic that only small terms should be neglected. The resulting theory appears thus as a logical approximation for interaction energies below 100 meV, i.e., involving only electrons, positrons and photons, but not particles such as mesons or baryons. For low energies, the theory is relativistically invariant, but how to extend it to higher energies is not yet clear. It yields the same results for the Lamb shift and the anomalous moment of the electron as the previous calculations based on the Schrödinger equation but employing ad hoc working rules.

A serious difficulty of the new approach is that the vector quantities appearing in the equations resulting from the Heisenberg picture cannot be given a simple physical interpretation, but Dirac remarked that in the early development of quantum mechanics the equations preceeded the physical interpretation, and he is confident that further development of the Heisenberg form of quantum electrodynamics will overcome this problem. The Schrödinger picture, being vastly simpler and more convenient to handle than the Heisenberg picture, will continue to be useful for systems with a finite number of degrees of freedom. The Heisenberg picture, however, has a more fundamental validity than the Schrödinger approach, and is indispensable for the treatment of problems with an infinite number of degrees of freedom, such as occur in quantum electrodynamics.

Ne'eman, who preceded Dirac, surveyed the present status of elementary particle theory. He compared it with the status of chemical atomic theory about 100 years ago, when Mendelejeff and Lothar Meyer began to discover certain patterns in the arrangement of the elements according to their atomic weights. Just as the recognition of these patterns had led to significant discoveries (e.g., of new elements) long before we knew anything about the structure of the atom, the patterns which we are now beginning to recognize among the multitudes of "elementary" particles are leading to the prediction of the existence and later discovery of new particles (such as the Ω^-). The next problem will be the explanation of these patterns in terms of particle structure; whether this will lead to the "appearance" of sub-particles as building blocks from which the various structures are to be constructed (as in the case of the atoms of the chemical elements) or to a closed-circle systematics in which each particle may appear as a component of the others, is still open to speculation.

Blatt, the third speaker of the invited papers section, chose the Theory of Superconductivity as his subject. He pointed to the enormous interval of almost 40 years between the discovery of the phenomenon and the appearance of the first microscopic theory which was capable of explaining some of its salient features. Although the theory proposed by Fröhlich in 1950 was far from correct, it contained some valid ideas, and more important, asked the right questions for the development of a better theory. The speaker then sketched the basic ideas of the BCS theory, particularly the replacement of the assumption of free electrons in a superconductor by the introduction of electron pairs as fundamental units, thus making it possible to obtain Bose-Einstein condensation of the carriers which single electrons, being Fermions, cannot accomplish.

One of the three half-day periods available for the meeting was devoted to a discussion of the problem "Applied Science." While in most "developed" countries applied science is receiving an overwhelming share of the total support for science, and while the Government of Israel is making strong efforts to promote applied science, the ratio of effort in basic to applied science in Israel is roughly the reverse of what it is in the US or in Western Europe. How to find and establish the proper position of applied physics in a developing country like Israel was the question debated by three invited speakers and a fairly large number of the audience. Everyone seemed to agree that science could do a lot for the economic development of the country, and almost everybody agreed that while basic science in Israel can hold its own in comparison with most other countries, it has failed to interact with the economic sector in a mutually satisfactory way. Prof. W. Low of the Hebrew University pointed out that basic research frequently contains important by-products which may be suitable for economic exploitation, but that somebody must extract these by-products and put them to use; he singled out the interaction of MIT and the R and D companies on "Route 128" in the Boston area as an example of proper collaboration. Prof. J. Jaffe of the Weizmann Institute advocated the founding of new industries which would be able to profit from scientific research; and Dr. I. Galil, Managing Director of Elron Industries in Haifa, one of the few electronics firms in Israel, pointed to the need for a primary local market for the successful development of such industries. The lively discussion seemed to be far more successful in defining problems than in offering solutions; it was agreed that there are already a few industries sufficiently strong to utilize "applied" scientists, but they cannot find the right type who would be willing to work there instead of in an academic environment.

On the other hand, if the universities of the country would train a reasonable number of "applied" scientists, where would they find desirable jobs? The problem seems to revolve around two phenomena, one being the "feed-back" between science and technology, and the second the "critical size" of the economy which has to be reached before the chain reaction: Science-Technology-Production-Sales-Jobs can sustain itself. All this sounded vaguely familiar, though expressed in a less familiar language (Hebrew), but it was an interesting and stimulating morning.

In contrast to the two sessions featuring invited speakers, the two other simultaneous sessions devoted to short contributed papers proved to be less interesting. There were eight papers scheduled for each of these sessions, ranging in subject matter from elementary particle theory to new detectors for uv radiation, with some relativity theory and solid state physics thrown in. As far as this writer could observe, there were no startling announcements of new results. The less satisfactory content of these sessions may have been due to the haste with which the meeting was arranged -- the call for papers appeared on the bulletin boards less than a month before the date of the convention.
(I. Estermann)

Lasers and Anti-tank Missiles

For a number of years theoretical physicists have speculated about the possibility of employing anti-matter (e.g., anti-protons) as radiation weapon systems, the idea being that the combination of matter and anti-matter could prove intriguingly destructive.

Recently, the British Aircraft Corporation and the Belgian Fabrique Nationale d'Armes de Guerre have joined hands (or arms for arms sake?) to produce a laser-guided anti-tank missile. This note is merely intended to assure nuclear physicists that anti-tanks are not large conglomerates of anti-matter!

A report from Brig. W.F.K. Thompson, the London Daily Telegraph's military correspondent, states that these missiles /named Atlas (anti-tank laser-assisted system)/, to be built at a cost of $140 each, will be ten times cheaper than comparable wire-guided ones, and can be employed by NATO for ranges up to one mile.

Using a hollow charge warhead, Atlas requires no guidance when fired at short range from its recoiless gun, but at longer ranges the tank "jockey" will be expected to flood the enemy tank with infrared from an undisclosed, but presumably semi-conductor laser, source. At some 100 yards from the target tank, the warhead will detect the reflected laser signal, fire a metal slug to provide appropriate directional correction, and proceed on its corrected trajectory to the tank.

Additional comments in the Brigadier's report go on to note that a separate man will be needed to direct the laser, which, being infrared, "is undetectable." However, the laser operator can be simultaneously servicing a number of anti-tank guns, he notes.

Firm orders have not yet been placed for this anti-tank missile, which should prove equally effective by day or night.
(E.H. Weinberg)

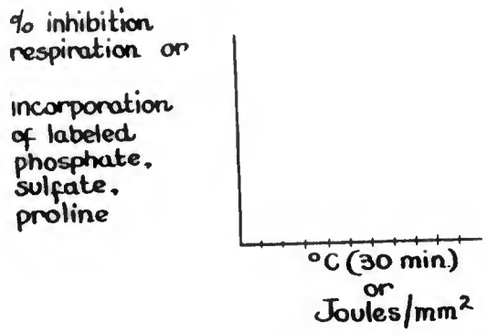
Burns and Lasers

The Industrial Injuries and Burns Research Unit, under the direction of J.P. Bull, MD, is located within the Birmingham Accident Hospital, Bath Row, Birmingham 15, England. The function of the Unit is to investigate the causes, local and general pathology, complications and treatment of accidental injuries. Most attention has been devoted to investigations relating to burns, because of the relative ease with which they can be classified and the availability of reasonable number of clinical cases in the Accident Hospital.

In general, the studies have been conducted in conformity with the general pattern of such research and have included investigations on shock, effect of toxins, plasma proteins, serum lipoproteins, serum electrolytes and acid-base balance, skin metabolism, and infection following burns. The Unit has contributed considerable data to support the use of high-molecular-weight dextran in treatment of burned patients. The investigations on use of hyperimmune serum to prevent serious Pseudomonas aeruginosa infection in burned patients have resulted in considerable optimism. A serum containing six different strains appears to provide cross protection for all strains commonly causing infection in the study population. The research department of a commercial pharmaceutical company is currently preparing such a polyvalent immune serum for clinical trials at the Unit. Another recent study suggests that a new synthetic pencillin produced by Beecham Group, Ltd., and known as AB2064 is very effective in preventing P. aeruginosa infection after burn injuries.

The Unit has been investigating possible harmful skin effects of lasers during recent months. These studies have utilized techniques used in thermal burn work. Small segments of split-thickness skin (non-pigmented) are maintained in media for short periods of time (about 3 days). The laser beam is focused on this tissue. Determination of cellular respiration and metabolic utilization of labeled phosphate, sulfate, and proline was performed on the irradiated skin tissue. These results were compared with similar determinations on control skin and skin tissue subjected to thermal injury. Previous investigations on thermal burns have revealed that a sigmoid curve results when one

plots percentage of respiratory inhibition or inhibition of utilization of the above named substances against temperatures in the range 37-50° C for 30 minutes. The laser-irradiated skin provides a similar curve when respiration is measured, but plots of incorporation of phosphates and proline provide substantially different curves. (Results of these studies are currently being prepared for submission for publication by the responsible investigators.) The investigators are attempting to correlate thermal damage and irradiation damage, in order to allow laser energy to be compared with thermal energy as diagramatically depicted below:



For these laser studies the group has available a NELAS 25 joule, 500 microsecond laser incorporating a Mellar ruby. By employing normal cone calorimetric measurements, these skin specimens have been found to absorb about 40% of the 6943 Å radiation and to reflect about 15 percent. Dosages ranging from 0.1 up to 1 or 2 joules/mm^2 have been used. During our visit, the question was broached of calculating the temperature rise in the skin due to these laser dosages, because the group hoped to correlate their previous thermal exposure data with these new measurements. At present, however, their attempts have led to calculated temperatures of several thousands of degrees, and it was tactfully suggested that a skin heat of vaporization must be employed in order to make any reasonable heat-balance calculation. We described some of the current plasma blow-off research which shows how difficult these problems are, even for well-defined materials such as metal or glass. It seems possible that the Unit's earlier "thermal damage" studies involve a sort of "cooking" or "refluxing" time, in which processes which involve chemical or biochemical interaction are speeded up in proportion to the increase in the number of reactants in the high speed "tail" of the Boltzmann distribution -- and that a major kinetic theory analysis would be required to correlate these results with what otherwise appears to be purely an energy damage mechanism, not easily related to the ambient temperature. Bull, J.C. Lawrence, and C.R. Ricketts intend to continue their radiation studies, perhaps with pulsed flash lamps, to determine over what range of radiation time it is possible to observe the same damage for the same energy radiated. If found, such data will at least go far to support our own feeling that their results probably do not depend on either the "uniqueness" of a coherent source or of a particular wavelength.
(C.H. Miller and E.H. Weinberg)

Delay Devices for Pulse-Compression Radar

A conference was held at the Institution of Electrical Engineers, Savoy Place, London on 21 February 1966, for the discussion of current research and developments in delay devices for pulse-compression radar. Organized by the Electronics Division of the IEE, the conference brought together a group of about 120 highly-qualified radar engineers from commercial and government laboratories in the UK. Formal papers were given by speakers from the Royal Radar Establishment (RRE), the Admiralty Surface Weapons Establishment (ASWE), Marconi Co., GEC (Electronics), Mullard Research Laboratories, and the Universities of Leeds and Glasgow. A paper on transverse equalization was given by an American, A.C. Price of Bell Telephone Laboratories. As many in this field know, Price was co-author of the paper entitled "The Theory and Design of Chirp Radars," which appeared in the Bell System Technical Journal, 39, 745-808, July 1960.

The eighteen papers presented were divided into three groups: IF dispersors, IF signal-processing techniques, and microwave dispersors. The requirements for delay devices for pulse-compression radar was discussed and some experimental results were shown. Lumped-constant dispersive networks and ultrasonic diffraction-grating dispersive devices were described. The basic properties of the helicon, a solid-state plasma wave, were described by A.C. Baynham (RRE) in a paper entitled "Dispersion Characteristics of Helicon Waves." He discussed current observational techniques, propagation characteristics of the helicon, its potential for dispersive delay applications, and methods of calculating the differential delay times available from a helicon delay device. Among the other techniques discussed were tapped delay lines, optical correlation, coherent memory filters, waveguide filters and delay lines, cascaded hybrid rings, magnetically saturated YIG crystals, and transverse equalization.

In summary, I.L. Davies (RRE) pointed out that the conference had been spurred by the needs in radar for high equivalent peak-power and for more flexibility, the ability to choose between operating modes so that one can obtain either optimum velocity information or optimum range

resolution. Sensible systems have been developed which provide equivalent system bandwidths as great as 20 mc, but even for these relatively narrow bandwidths the techniques require large systems that are difficult to set up and too complex for operational use. Acoustic techniques appear to provide promise of ultimately furnishing system bandwidths approaching 100 Mc, but they involve problems of inefficient coupling which have plagued ferrite devices. Although waveguides can be used as dispersive elements, the use of hundreds of meters of waveguide does not constitute a practical technique for many radar applications. There remains a strong need for engineering ideas which will permit the attainment of gigacycle bandwidths.

A publication containing texts of papers given at the conference will be available about 1 May 1966 for approximately £2.0.0 ($5.60) each and may be obtained from the Secretary, Institute of Electrical Engineers, Savoy Place, London, WC 2.
(C.E. Barley and M.W. Long)

PSYCHOLOGICAL SCIENCES

Psychiatry at the Welsh School of Medicine, Cardiff

Although the Welsh National School of Medicine was opened in 1920, a chair in psychiatry was not established until the fall of 1964. Training in the new Department of Psychiatry is carried out at Whitchurch Hospital under the direction of Prof. Kenneth Rawnsley. In addition to the professor, provision has been made for a staff of one lecturer and five part-time members. A residency program in psychiatry has been established, and senior medical students are rotated through the Department on part-time clerkships. A series of lectures in general psychiatry has been inaugurated as part of the medical curriculum, as well as a series of special lectures which are presented for the Departments of Obstetrics and Pediatrics.

For several years prior to assuming his present duties Rawnsley was on the staff of the MRC Social Psychiatry Research Unit at the Maudsley Hospital in London. Much of his actual research data, however, was collected in the Rhondda Valley of South Wales. This region possesses a number of characteristics which make it an ideal area in which to study the epidemiology of mental disorders and related problems. In spite of the responsibilities of a newly established department, Rawnsley has continued his own research interests, and at least two of his Maudsley colleagues are now in the Cardiff area. Excellent relationships have been established with the MRC Pneumoconiosis Research Unit at Cardiff, so that it is possible to capitalize on the carefully-defined populations which have been developed over the years by this latter group in its own large-scale medical surveys. Thus, it is quite possible that the passing of time will see the development of a significant psychiatric epidemiology research program in Cardiff.

Rawnsley's interest in the Rhondda Valley and South Wales grew out of his concern with methodological problems related to the epidemiology of mental disorders, such as the development of case-finding techniques and the measurement of deviant behavior. With his colleagues J.G. Ingham and J.O. Robinson, both of whom are now in the Cardiff area, he conducted a series of studies in which the entire valley population was used rather than a sampling technique (Advancement of Science, Sept. 1961). His interests and current research have now extended to the problems of recognizing and classifying deviant behavior, cultural attitudes toward expression of symptoms, referral of patients, and the relationship of controls on expression to the prevalence of psychiatric symptomatology.

Although Rawnsley's current work is focused on relatively isolated total populations in the UK, one of his most intriguing studies (and one quite representative of the quality of his work) was made of the population of Tristan da Cunha -- a small island in the South Atlantic ocean. Tristan da Cunha was settled by a small British force in 1816 in an effort to prevent the French from using the island as a base for rescuing Napoleon from St. Helena, some 1500 miles to the north. The present population is largely descended from individuals who inhabited the island in the first quarter of the nineteenth century. The population of 264 persons (1963) represents approximately 65 families who all live on a relatively small plain of the island, which actually is nothing more than a volcanic cone rising out of the ocean. Except for missionaries, a few British government officials, and a small frozen crayfish plant, the way of life has changed little over the past 150 years. The inhabitants have lived off the land and the sea, occasionally bartering goods with passing ships. Money did not become established as a primary medium of exchange until World War II.

In 1961 the volcano on Tristan da Cunha erupted and the islanders were evacuated to England. However, the cultural change was so drastic that all but 14 returned to their island after two years. In addition to the romantic or adventurous appeal which their fairy-tale group may hold, it also constitutes an extraordinary population for investigators concerned with the epidemiology of mental disorder. Detailed records on the population which span almost

the entire 150 years of its existence are available and there is complete documentation by an outside group of an episode of mass hysteria which occurred in 1937-38. Nineteen of the twenty-one victims of this outbreak were available during the group's stay in England several years ago (Rawnsley, K. and Loudon, J.B. The British Journal of Psychiatry, 110, pp 830-839, 1964).

The social anthropology of this group was described. A study was also made, from historical documents, of the four cases of psychotic illness recognized by their peers as having been suffered by an islander during the 100 years prior to evacuation. All four cases were from the same family. Almost every adult member of the population was interviewed during the course of the study, and information on every member was obtained from the physician who had lived and worked with the islanders before their evacuation to England. Three cases of senility and one of psychotic depression were diagnosed in the present population.

Of particular interest was the opportunity to examine individuals who had been afflicted with disturbances of consciousness, choking, and/or convulsions during the episode of mass hysteria. Of import in terms of the problem of retrospective falsification is the fact that only eight of the nineteen persons acknowledged having suffered the attack upon interview twenty-five years later. While there have been occasional "spells" or recurrences of the hysterial behavior from time to time among individuals, there have been no further mass phenomena. On the other hand, the hysteria victims tended to visit the island doctor with almost twice the frequency as a control group from the same population. While the etiology of the 1937 outbreak was not ascertained with certainty there appears to have been a combination of factors, including repressed sexual conflict, strained family relationships, and rebellion against the monotonously regulated community life.

The proportion of the Tristan population reportedly suffering from frequent headache at the present time, as well as the nature of their complaints, is quite striking. Thus, 66% of the population reported suffering a characteristic and remarkably uniform bi-frontal headache syndrome in 1962, while only 6% complained of headache during the 1938 survey. Moreover, a highly significant proportion of the "spell" victims now suffer headaches -- in fact, 18 of the 19 surviving subjects. When one considers that ten of the 23 island leaders are married to women who suffered hysterial attacks in 1938, it is interesting to speculate both on the shifts which have occurred in symptomatology and the possible spread of this more socially acceptable and less dramatic syndrome to a larger segment of the population.
(J.E. Rasmussen)

Semi-Automated Instruction in Automation at the Technical University of Berlin

A recent issue of VDI-Nachrichten (News of the Society of German Engineers) described a new teaching technique which has been in use at the Technical University of Berlin for approximately a year. The new procedure incorporates some of the features of programmed instruction, the language laboratory, and the classroom communicator.

The rationale underlying the development of the course was essentially the recognition of the breadth of the automation "problem"; its interdisciplinary nature and the role of education in fostering a satisfactory adjustment to its impact on economic, technical, organizational, and social matters. Informed people will see automation as an evolutionary phenomenon. For the uninformed, it will be a terrifying revolution. Consequently, the University has introduced a two-part series of interdisciplinary semi-automated lectures on automation for senior students in engineering, economics, industrial management, mathematics, sociology, and psychology.

The first part of the series involves general orientation, and is intended to provide the students from diverse training backgrounds with a common language, the jargon of automation, in order to make the concepts of automation understandable. This includes introductory material emphasizing the interdisciplinary nature of automation; lectures on drives, controls, and measuring devices and their mechanical, electrical, electronic, hydraulic, and pneumatic components; the principles of logical decision events, circuits, and control techniques; an introduction to systems engineering; and case studies from various industries, emphasizing those where automation has had a significant economic and sociological impact. The second part involves more intensive instruction on specific topics related to automation, e.g., Boolean algebra, data processing and information transmittal, detailed study of the properties of the pneumatic or electronic components that are used frequently in automated systems, and the like. Student participation is voluntary.

Lectures of from 40 to 45 minutes are prepared by teaching assistants under the guidance of their respective professors and are recorded on tape. Care is taken to insure that the recorded lectures are of high quality, both from the standpoint of clarity of speech and of content. This demand for clarity and conciseness is reported to provide valuable instruction for the teaching assistants. All pictures, graphs, formulae, mathematical derivations, etc., involved are prepared on slides and are triggered by impulses recorded on the tape. The slides are such

that they may be projected clearly in a well-lighted room without the need for lowering the normally-present illumination level. In addition, the visually-presented materials are reproduced in workbooks which are provided to the students. Space is provided in the books for notes, but there is no text. This must be extracted by the students from the taped lectures. Suggestions for supplementary courses or outside reading are provided in the workbook.

The layout of the lecture room provides for about 20 students, two to a table. Each pair shares the use of a button mounted on the tabletop midway between them. The button is pressed when a student requires clarification of some point in the recorded presentation. Pressing it stops the tape and the discussion leader takes over. The question raised is answered through group discussion guided by the teacher who, when the point at issue has been clarified, re-starts the recorder and projector. The recorded lecture then proceeds until stopped again by a student. Experience has shown that the time involved is about the same as a conventional seminar. Similarly, the restriction of class size to not more than 20 students is a decision derived from experience with seminars in which the optimum number of students appears to be from 15 to 20. If larger numbers are interested, additional lecture groups are formed. Adjacent to the lecture room is a small library containing most of the recommended supplementary reading materials and available for voluntary after-class study. Students who desire to repeat lectures or who have been unable to attend the scheduled sessions may borrow the tapes and slides and use the lecture-room facilities at times when it is free. Opportunity for interaction with the instructor is, of course, lost in these circumstances. The tapes may also be borrowed for home use if the student has the proper equipment and guarantees not to damage the recorded material.

A number of advantages are seen for the system. The active participation of the instructor is confined to the difficult phases of the course. The feedback he gains from student questions enables him to revise and clarify the lecture materials on a continuing basis, and this is easily accomplished technically. His usual time-consuming blackboard work is eliminated. Preserving the seminar approach has counteracted the sterility of a completely "canned" presentation. Much of the student's notetaking labor has been eliminated, especially that involved in copying drawings, formulae, or other blackboard-presented information. Students may pace the presentation through the use of their stop buttons. Certain administrative benefits have accrued, e.g., class scheduling has been made easier in an interdisciplinary situation where schedule conflicts among departments frequently occur. The learning efficiency of the system is said to be high, although no systematic comparative data appear to have been collected. However, it was reported that those students who took a very difficult end-of-course examination (voluntary) made better-than-average grades. One of the principal advantages has been the opportunity that has been provided for exploiting the teaching skills of the staff with less sacrifice of the time they prefer to devote to research. The University considers that in many ways its educational experiment demonstrates that properly-handled automation can be quite beneficial.
(B. Bartocha and J.A. Nagay)

Valedictory of Chairman of Occupational Psychology Section, B.P.S.

As his valedictory address to the members of the Occupational Psychology Section of the British Psychological Society, Gerald A. Randell (Birkbeck College) spoke on the topic, "A Systems Approach to Industrial Behaviour." Pointing out that in applied psychology one is faced with many overlapping criteria dependent upon many interrelated variables, which in turn are acted upon by various interdependent treatments, Randell went on to propose an empirically-based descriptive system interrelating known variables in industrial behavior. Figure 1 shows the system in diagrammatic form. Randell emphasized that the system is not complete, and that it is not a flow diagram, although it looks like one; all parts of the system interact. It differs from previously-proposed descriptions in that it attempts to show the main points of interaction among groups of variables, treatments and constraints within a unified account of the subject matter of industrial behavior. Changes within any of the groups of variables will effect changes in system output; but as Randell pointed out, they also interact with each other, and it is these interactions which are critical areas for research.

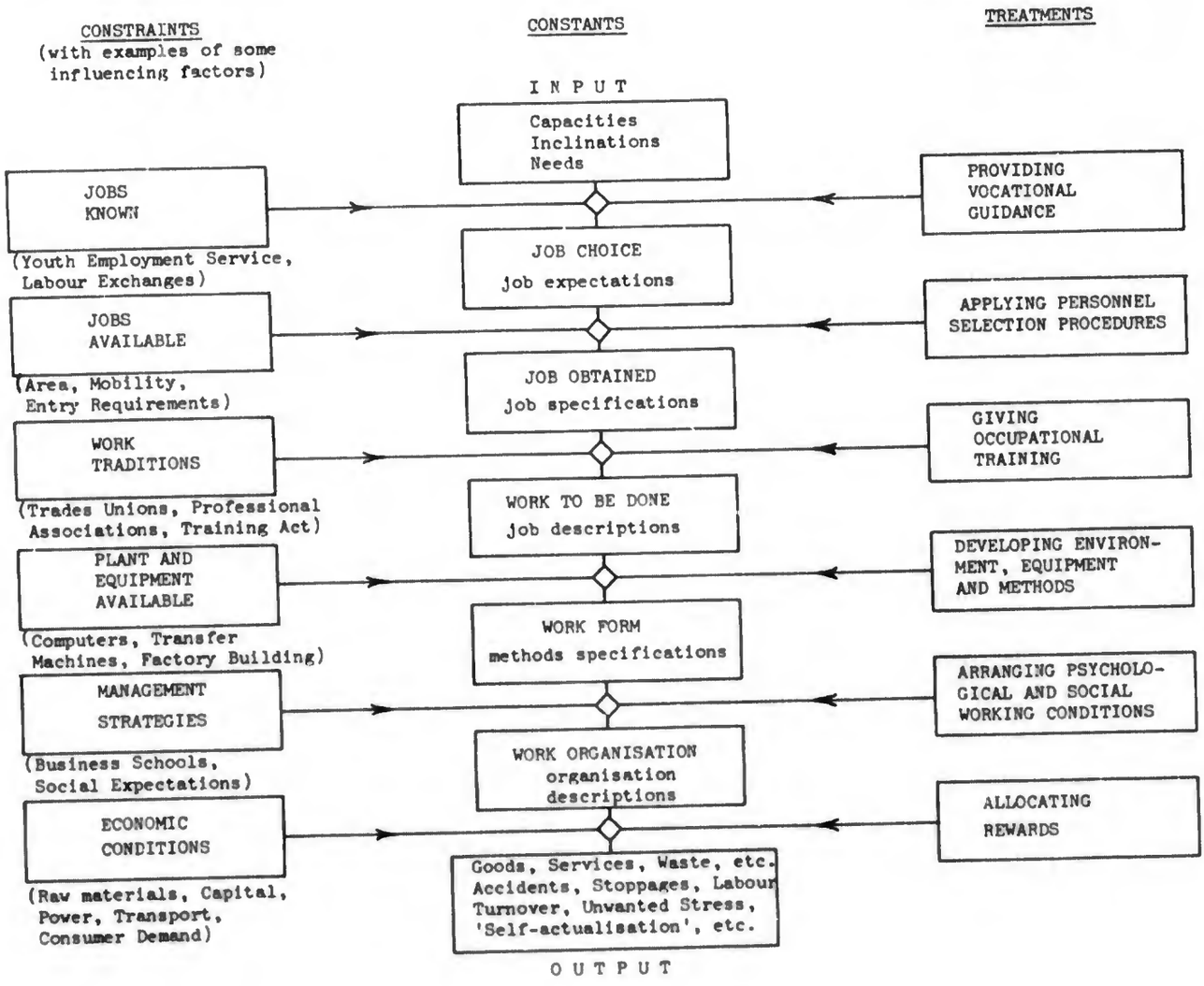


Figure 1.

The input to the system is the worker's potential behavior. The stages through which the input passes are held to be reasonably clearcut and stable, and hence are called "constants." The "treatments" shown on the right of the figure are the techniques employed to optimize the transition between stages. The "constraints" are imposed on the system by the environment, and they are groups of variables which can also affect output and interact with other system variables. The system is an open system in constant multiple interaction with its environment. It consists of many mutually dependent subsystems also in dynamic interaction, and is described in terms of stable processes rather than in terms of such characteristics as size, shape, function or structure.

Randell then went on to point out that considerable research is needed before the main objective of the approach, i.e., techniques for the prediction and control of industrial behavior, can be realized. A host of such problems are particularly associated with the need for more precision in measuring the variables and the relationships between inputs, treatments, constraints and outcomes. He speculated on the utility of psycho-physical methods in the measurement of system variables, and indicated the ways in which canonical analysis, three-mode and other types of factor analysis, discriminant analysis, and other multivariate methods can contribute to greater precision of measurement. The need for techniques to enable the apportionment of causal contributions is particularly acute.

Randell outlined a number of practical advantages that such a systems approach to industrial behavior might have for the occupational psychologist. It could serve as a diagnostic aid and assist in pinpointing the areas where maximum pay-off could be obtained through the professional psychologist's efforts. It might serve to encourage industrial clients to collect system output data more systematically. Long-range manpower planning would be more effective if backed by study of the variables as an open system.

In his closing remarks, Randell emphasized the difficulties inherent in the system: the problems involved in calculating total variance; the extra difficulties imposed by the dynamic and changing nature of the systems under study; the problems of scaling what often seems to be unscalable. He pointed out that he had not touched upon the subsystems of variables generated by the presence of cohesive social groups within the labor force, and had ignored the role of motivation. He indicated that the system was not based on data collected painstakingly over many years, but was offered rather as a stimulus to subsequent lines of thought and discussion. The full paper will be published in a forthcoming issue of Occupational Psychology.
(J.A. Nagay)

SPACE (?) SCIENCES

"More Things in Heaven and Earth ..."

After all, I suppose there is no reason why we shouldn't have flying saucers over here as well as in the USA. But one UFO, recently reported in The Observer (appropriately titled under the circumstances?) was said to resemble tapioca, my favorite dessert! Whatever it was, it was seen by two young ladies on an auto tour in Ireland. (Why are these wraiths so often spotted by people driving automobiles; did anyone ever see one while lying in bed, looking out the window? And how appropriately seen in Ireland, with its wonderful tradition of leprechauns, werewolves and little green men!)

Anyway, the young ladies took a picture of it -- there is no doubt about that. The tapioca effect concerns the "efflux" from the thing, which "gets bunched up some time after streaming out, and then thins away again."

Mr. Charles Gibbs-Smith, an aviation historian who described the observation, thinks it may very well be an interplanetary phenomenon and says: "Who do we think we are? ... One of the reasons that people are so opposed to the interplanetary explanation is that we're such an ineradicably conceited civilization: a very limited third-rate system on the edge of the Milky Way." (That for you!) "How stupid people are about things they don't understand; they always explain the unknown in terms of the known."

Yes, but how fortunate that they are not entirely dominated by the "un-stupid" who always explain the known in terms of the unknown. My own explanation, based upon the soft luminosity of the phenomenon: It is Doctor Who, slipped off the BBC television screen while escaping from the Daleks!
(N.W. Rakestraw)

NEWS AND NOTES

Irish Observations

Armagh, Northern Ireland, which was the ancient seat of the Church of St. Patrick, is also the site of an observatory which recently received a grant from Harvard. In an almost unique example of cooperation between Northern Ireland and Eire, the observatories of Armagh and Dunsink (outside of Dublin in Eire) are jointly participating in a project under the auspices of Harvard University. Most of the work consists of the interpretation of photographs sent from South Africa. Harvard has contributed £40,000 to the project, but most of the salaries and expenses are paid by the governments concerned. A planetarium is expected to be opened to the public at Armagh by the end of the year. Dr. E.M. Lindsay is the Director of the Armagh Observatory. No less a person that the President of Eire, Eamon de Valera, has been supporting the reopening of the Observatory at Dunsink. It is to be hoped that scientific cooperation of this sort will continue between the North and the South and help to heal the ancient sores.
(J.G. Brennan)

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German Scientists Agitate for Pay Raise

The Bonn government has been warned of the possibility of a strike by an organization that represents 1300 German scientists unless salary demands are met. The Association of Scientists at Research Institutes is demanding salary raises for some 3500 research workers at 80 federal, state and community supported non-university institutes throughout West Germany.

The protest movement was signalled last December when 2300 employees at the Karlsruhe atomic research center signed a petition asking for more money. At the end of January, Federal Minister for Scientific Research, Gerhard Stoltenberg, went to Munich to discuss the salary situation with the representatives of the employees' association.

The organization would like to see the federal salary scale raised so that the minimum monthly salary for scientists would be 1073 DM (268) and the maximum set at 7880 DM ($1,970). The present maximum salary varies between $300 and $500 per month. Stoltenberg has promised to study the demands, and the scientists are not threatening any immediate strike action. However, in a recent resolution of the Association, they reserved the right to take any action necessary to get their demands.

More effective than a possible strike, perhaps, in forcing the government to act is the so-called "brain drain," the emigration of scientists and technicians to the United States. Unofficial estimates from the Ministry of Scientific Research are that between 2,000 and 3,000 German scientists and technicians have already left and are working in the US.
(J.G. Brennan)

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Civilization Is Hard To Resist

On 17th February, after the article on page 29 was written, the London newspapers carried a prominent but brief note on the inhabitants of Tristan da Cunha. Reportedly, two years' absence from electric lights, TV, automobiles and running water, has been too much for approximately 40 of the island's population. This group will return to Great Britain in May of this year, leaving approximately 250 persons on the island.
(J.E. Rasmussen)

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Meetings

The Institute of Physics and The Physical Society announces that the Nuclear Physics Sub-Committee is arranging a conference on Nuclear and Particle Physics to be held at the Univ. of Glasgow, 21-23 Sept 1966. The main topics will be as follows: Coulomb excitation in medium and heavy nuclei; Nuclear photo-effect at high energies; Nuclear structure and electron scattering; Nuclear Beta decay; Strange particle weak decays; Strong interactions peripheral model; Resonances and symmetry schemes.

The International School of Physics "Ettore Majorana" summer program is on the subject of "Strong and Weak Interactions - Present Problems." The course will be held at Erice (Trapani), Sicily, 19 June - 4 July 1966. Applications for attendance should be sent to Dr. T. Massam, CERN, 1211 Geneva 239, Switzerland.

The Autumn Meeting of the French Society of Metallurgy will be held at Maison de la Chimie, 28 bis rue St. Dominique, Paris, 17-21 October 1966. The subjects under discussion will be the relations between the physical and chemical heterogeneities of metals and alloys and their properties; and corrosion under stress.

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Marine scientists at the Univ. of North Wales, Bangor, are making a study of the speed and direction of currents at the bottom of the Irish Sea. They have chartered a motor-vessel and have dropped drifters, which are labelled as to when and where they were dropped, and are paying 70 cents for each drifter returned by a finder. In their program to "assess the potential of the sea" for the future, the group are also trying to find out why the composition of water varies in its different parts.

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A study group on British oceanography has been formed in the House of Commons under the chairmanship of Member of Parliament Dr. Wyndham Davies, who was at one time in the Medical Services of the Navy, where he specialized in problems of tolerance of sailors to tropical conditions and worked on problems of drowning. The study group aims to help the development of British oceanographic work, and there are also plans to form a British Oceanography Society.

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A grant of £20,700 has been made by the University Grants Committee to Dr. W. Taylor, Lecturer in Industrial Health, Dept. of Social Medicine, and Mr. R.J.H. Brush, Lecturer in the Dept. of Electrical Engineering, at the Univ. of St. Andrews, for the construction of an anechoic chamber and acoustic laboratory for teaching and research into noise measurements.

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The College of Air Training at Hamble, near Southampton, is to double in size. The College is under the joint sponsorship of the Ministry of Aviation, and the airlines BOAC and BEA, and trains civil airline pilots in Britain.

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Personal News

Dr. J.T. Stuart has been appointed to the Chair of Theoretical Fluid Mechanics at the Imperial College of Science and Technology, London, from 1 Oct 1966. He is at present Senior Principal Scientific Officer at the Aerodynamics Division, National Physical Laboratory, Teddington.

Marcel Boiteux, Director of the Direction de l'Electricité de France, has replaced Prof. Blanc-Lapierre as President of the French Advisory Committee for Scientific and Technical Research.

Surgeon Rear-Admiral E.D. Caldwell has been promoted Surgeon Vice-Admiral and appointed Medical Director-General of the Royal Navy.

Dr. A.D. Buckingham has left the Inorganic Chemistry Laboratory, Oxford Univ., to become Professor of Theoretical Chemistry at the Univ. of Bristol.

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

Dr. B.R. Coles, Reader in Physics at the Imperial College of Science and Technology, has been appointed to the Chair of Solid State Physics at the College, as from 1 Oct 1966.

Dr. I.M. Mills, Reader in Chemistry, has been appointed Professor of Chemical Spectroscopy at the Univ. of Reading.

Prof. M.A. Bouman, Director of the Institute of Perception RVO-TNO, Soesterberg, The Netherlands, has retired. He is replaced by Dr. P.L. Walraven.

Andrew Stratton has been appointed Professor and Head of the Department of Mathematics at the College of Aeronautics, Cranfield, as from 1 March 1966.

Dr. M.P. Allen and Dr. O. Simpson have been appointed Deputy Directors at the National Physical Laboratory, Teddington. Allen's section will be Materials Science and Simpson's, Measurement Science.

Dr. J.G. Davies, Reader in Radio Astronomy at the Univ. of Manchester, has been appointed to a Chair of Radio Astronomy from 1 Feb 1966. He has specialized in work on radio echo observations, meteor orbits, and radio emissions from space.

Directors have been appointed for the two new forensic science laboratories. Dr. A.S. Curry, presently Director of the East Midlands Forensic Science Laboratory at Nottingham, is to be Director of the Central Research Laboratory to open at Aldermaston in October.

Dr. I.G. Holden, Deputy Director of the Metropolitan Police Laboratory, is to be Director of the Home Counties Forensic Science Laboratory to open next April, also at Aldermaston.

Prof. G.M. Bull, Professor of Medicine at Queen's Univ. Belfast, is Director-designate of the Medical Research Council's Clinical Research Center, which is presently being built at Northwick Park, near London.

Mr. John Clemow has been appointed Head of the Nuclear Physics Division of the Science Research Council in succession to Dr. A.C.W. Clarke.

Prof. Louis Leprince-Ringuet has been elected a member of the Académie Française. He is one of only three scientists among the present "Immortals," and is known for his work on cosmic rays and mesons.

Dr. W.C. Marshall, presently head of the Theoretical Physics Division of Atomic Energy Research Establishment at Harwell, has been appointed Deputy Director of the Establishment as of 1 March 1966.

Dr. P.J. Grant, Reader in Engineering Science at the Imperial College of Science and Technology, London, has been appointed to the Chair of Nuclear Power at that College.

Prof. A.C. Offord, Prof. of Mathematics at Birkbeck College, London, has been appointed to the Chair of Mathematics at the London School of Economics and Political Science.

John Maddox, science correspondent of the Guardian, is to assume editorship of Nature in the summer of this year.

Prof. Hans Pettersson, the eminent oceanographer, died at Göteborg, Sweden, on January 25, at the age of 77.

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 09510.

ONRL-2-66 Nuclear and High Energy Physics in Northern Italy, Nov. 1965 by J.G. Brennan

ONRL-3-66 Some Solid State Physics in Warsaw and Prague by B.O. Seraphin

ONRL-4-66 Lasers in the UK - Part III, National Physical Laboratory by E.H. Weinberg

ONRL-5-66 Solid State Physics in Some Universities In Southern Germany by B.O. Seraphin

ONRL-6-66 Programmed Instruction in Norway, Sweden and Denmark by J.A. Nagay

ONRL-7-66 Notes on Psychology at the Univ. College of South Wales and Monmouthshire by J.E. Rasmussen

ONRL-8-66 Edward Davies Chemical Laboratory, University College of Wales, Aberystwyth by B. Bartocha

ONRL-9-66 Dental Education in France and Switzerland by C.E. Meyers

The following conference reports are releasable to European scientists:

ONRL-C-2-66 Royal Society Meeting for Discussion of MHD Electrical Power Generation by E.L. Murphy

ONRL-C-3-66 International Colloquium on Leptospirosis, Antwerp, Belgium, 3-5 Dec 1965 by C.H. Miller

Prepared by the Scientific Staff
Submitted by P. King

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Commanding Officer

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13. ABSTRACT

This is a monthly publication presenting brief articles concerning recent developments in European scientific research. It is hoped that these articles (which do not constitute part of the scientific literature) may prove of value to both American and European scientists by disclosing interesting information well in advance of the usual scientific publications.

The articles are written by members of the scientific staff of ONRL, with an occasional article contributed by a visiting stateside scientist.

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