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EUROPEAN SCIENTIFIC NOTES

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Edited by Bernard Epstein and Victoria S. Hewitson

15 June 1966 ESN-20-6

Editor's Note

Many readers of ESN have written to express their appreciation of the exceptional quality of the articles written by Dr. Norris Rakestraw. A considerable number of these have dealt, in a charming manner, with amusing aspects of the contemporary European scene, but even his straightforward reporting on scientific activities has been characterized by a clarity and grace that are all too rare in technical writing.

Dr. Rakestraw's tour of duty with ONRL will terminate 10 June 1966, and he will assume a one-year appointment as Distinguished Visiting Professor at NRL, Washington. His ONR friends congratulate NRL on their splendid acquisition, and we hope that from time to time he will continue to favor ESN with some of his creative writing.

The Franks Commission Report on Oxford

The Robbins Report, published in 1963, presents the results of a two-year government-sponsored survey of all aspects of Britain's system of higher education -- universities, colleges of technology, teacher training colleges, etc. This report dwelt at length on the exceptional position occupied by the "Oxbridge" pair of universities -- Oxford and Cambridge. (Cf. ESN, April 1966.) On the one hand they enjoy a prestige which sets them above Britain's other universities; admission to one of these institutions is a cherished accomplishment and an important step in a successful career. On the other hand, the tradition-encrusted procedures, centering about the largely autonomous "colleges," have rendered these two universities highly inefficient and inarticulate in responding to Britain's urgent needs. Now that Oxbridge relies on public funds to almost the same extent as the newer, less prestigious, universities, the feeling has been growing that these two privileged institutions should be required to justify their procedures to the public. The Robbins Report spoke in harsh terms of some aspects of Oxbridge's aloofness, and questioned whether the special status they enjoy is compatible with their overall contribution to the nation. The opinion of the Robbins Committee was summed up in paragraph 687, which contains the strong passage: " .... the number of times when it is necessary to except Oxford and Cambridge from general statements about British universities, the difficulty both universities have in reaching rapid decisions on matters of policy with their present constitutional arrangements, and the general obscurity in which so many of their administrative and financial arrangements are shrouded are not compatible with a situation in which they, like other universities, are largely dependent on public funds. Continuance of such anomalies may well endanger not only their own welfare but also the effectiveness of the whole system of higher education in this country, of which they are and should be so splendid a part. We are aware that in both universities these problems are being considered and solutions sought. We recommend that, if Oxford and Cambridge are unable satisfactorily to solve these problems within a reasonable time, they should be the subject of independent inquiry."

Stung by the threat contained in the last sentence, Oxford's Hebdomadal Council appointed, in February 1964, a committee of three, headed by Lord Franks, Rector of Worcester College, "to consider the recommendations and criticisms in the Robbins Report and arising out of it which particularly affect Oxford; to establish how many of these are, or have recently been, the subject of investigation and the present state of such investigation; and to consider whether further investigations should be put in hand, and, if so, how they should be conducted."

This committee promptly recommended the appointment of a Commission of Inquiry to undertake a comprehensive survey of Oxford's role, both present and future, in Britain's educational system, "having regard to its position as both a national and an international

University." The proposed Commission, consisting of seven members of Oxford's own staff, headed by Lord Franks, was established in March 1964 and began holding sessions during the following month. Much of the material collected by the Commission was published as it became available, but the "Franks Report" itself has just been published (12 May 1966). (University of Oxford, Report of Commission of Inquiry; Vol. I /Report, Recommendations, and Statutory Appendix/, Vol. II /Statistical Appendix/; Oxford University Press.)

It is quite impossible to present here a detailed summary of the Report, but it is worthwhile, I believe, to indicate some of the main ideas and suggestions that appear in the Report. Receiving top billing in the Commission's recommendations is a long-overdue streamlining and clarification of Oxford's administrative procedures. Almost half of Vol. I of the Report is devoted to a detailed description of the current outmoded and obscure set-up, recommendations for improvements, and a complete set of proposed new statutes, ranging in scope from undergraduate admissions to the powers of the vice-chancellor (president).

Much attention is given to the problem of clarifying the financial obligations between the colleges and the University. In particular, a scheme is proposed whereby the more affluent colleges will contribute to a fund which will be used to improve the financial condition of the poorer colleges. Here the basic idea appears to be that the various colleges, while developing in certain directions with a considerable measure of freedom, should all have the financial resources to maintain and attract adequate numbers of fellows, both at the teaching and student ends of the scale.

Four significant sets of recommendations deal with proposed modifications of the size and make-up of the student body: A gradual increase from the current enrollment of 9500 to a proposed figure of 13,000 in about 15 years; an appreciable increase in the percentage of women students; an increase in the percentage of post-graduate students; and a considerable increase in the number of students "reading" in the natural sciences, with corresponding reductions (relatively, if not in absolute numbers) in the arts and social studies.

One of the most interesting and significant parts of the Report deals at length with Oxford's admission policy. Contrary to common opinion, Oxford and Cambridge do not get first choice of Britain's pool of talented youngsters. (Presumably like many other visitors, I have been told at both these universities that "we get the cream of the secondary schools.") In fact, the old prejudices favoring the "independent" schools (I have not seen the more common, and highly misleading, term "public school" used in the report) have been largely overcome; this is strongly suggested by the fact that the percentage of successful applicants varies little between the independent and the "maintained" (entirely state-supported) schools, as well as the "direct-grant" schools which stand somewhere between these two types. On the other hand, the percentage of qualified youngsters completing their secondary studies at the maintained schools who seek admission to Oxford is distressingly small. This appears to be due to two principal causes: first, the strong conviction, developed by centuries of tradition but now largely outdated, that Oxford does not welcome students from these schools; and second, the Oxford practice of requiring an extremely arduous entrance examination for which the independent schools, by their very nature as training grounds for Oxbridge, provide a better preparation than the maintained schools. The Report urges Oxford to take steps to modify its entrance requirements in such a manner as to attract a more representative cross-section. At the same time, it is hoped that the other universities will attract some students whose background and training lead them to think only in terms of Oxbridge.

The tutorial system, centered in the colleges, comes in for careful scrutiny. (A careful reading of the Report will undoubtedly prove helpful in explaining this system to Americans.) There has been much sentiment recently at Oxford for abandoning this system. However, the Report strongly favors the retention of the system with appropriate modifications. In particular, the "tutorial" session (the weekly encounters between student and tutor) should revert to their original function of providing guidance rather than imparting specific knowledge, and correspondingly, greater stress should be placed on seminars and lectures, which currently play a secondary, often quite minor, role.

One of Oxford's wealthiest colleges, All Souls, takes a severe scolding in the report. Unlike any of the other thirty-odd colleges, All Souls does not accept any students whatever, either undergraduate or post-graduate. Except for a number of honorary appointments, all members ("fellows") of this college are research scholars who form an isolated community which renders little assistance to the rest of Oxford. In fact, for some years All Souls has wrestled with the problem of spending a good fraction of its annual income, which is now close to £250,000 ($700,000)!

Oxford has officially "accepted" the report, but this does not imply approbation. A considerable part of the nation, including the entire academic community, is waiting to see

how Oxford will respond. It seems quite clear that the day is past when Oxbridge could merrily go its own way.
(B. Epstein)

BIOLOGICAL SCIENCES

June Meeting of the Physiological Society

The Physiological Society held its fifth meeting of the year at Oxford on 4 June 1966. Several papers which I found of special interest are summarized briefly below.

H.S. Gonzalez (Dept. of Physiology, University College, London) continues his studies on the properties of isolated skeletal muscle fibers. The general procedure involves the incorporation of a single fiber in a gelatin block which is then subjected to compression along the longitudinal axis of the fiber. Striation spacing is reduced to 1.8 - 1.9μ. Although this compression leaves the fiber as a whole straight, the myofibrils become wavy. When the myofibrils contract as a result of stimulation of the muscle fiber, they straighten out and then recover their initial wavy form during relaxation. The time course of these changes is followed with high-speed cinematography. Gonzalez has used this technique in other experiments to follow the spread of excitation from the surface to the core of a muscle fiber. The present experiments were designed to determine whether the process of muscle fiber relaxation is an active or passive one. This question has been the subject of considerable controversy for many years. By following the movements of a dust particle embedded in the gelatin block, as related in time to the redevelopment of waviness in the myofibrils during relaxation, it was shown that the dust particle moves more rapidly. From these observations it was concluded that changes in myofibrillar shape during relaxation are not due to elastic forces in the gelatin. Elongation of myofibrils appears to depend on forces within the fiber itself. These experiments, however, do not indicate whether these forces are elastic ones stored within the fiber during contraction or whether they are active ones that arise after contraction.

A very interesting paper on the action of pyrogens in rabbit brain was presented by K.E. Cooper, W.I. Cranston and A.J. Honour (MRC Body Temperature Research Unit, Radcliffe Infirmary, Oxford). Leucocyte pyrogen was introduced bilaterally into conscious rabbits in various areas of the brain. Fever resulted only after injections into the anterior hypothalamus and the supra- and pre-optic areas. Minimal latency between time of injection and onset of the febrile response occurred when the pyrogen was injected close to the wall of the third ventricle at the level of the optic chiasma. It appears that this fever response is the direct result of the action of leucocyte pyrogen on specific structures in these areas of the brain, since the effective dose was less than 1% of that required to evoke a similar response by intravenous administration.

P.C. Caldwell and A.G. Lowe (Dept. of Zoology, Univ. of Bristol and the Laboratory of the Marine Biological Association, Plymouth) reported their experiments on active transport of phosphate into squid axons. Orthhophosphate tagged with P^{32} was introduced into the artificial sea water medium and the axoplasm was subsequently extruded for determination of radioactivity. The P^{32} in the axoplasm was present as orthophosphate, ATP and arginine phosphate. The mean influx rate at temperatures of 17-21° C was 0.0196 p-mole/cm^2/sec. A fifty-fold increase in external phosphate concentration resulted in only a three- or four-fold increase in influx. Lowering of pH from 7.9 to 6.8 and electrical stimulation at a frequency of 50/sec had no significant effect on the influx of phosphate. Addition of 2mM cyanide or 0.4mM dinitrophenol to the medium inhibited influx of phosphate significantly, as did ouabain, a sodium pump inhibitor. These experiments indicate that phosphate entry into the squid axon is an active process dependent upon energy derived from metabolism, and that there may be some connection between the active transport of phosphate and the sodium-potassium pump.

D.G. Gwyn and G. Vrbova (Dept. of Anatomy, Birmingham Univ.) showed some results of their fascinating experiments which indicate a role of the muscle fiber itself in the maintenance of cholinesterase at the neuromyal junction. It has been proposed that this cholinesterase is synthesized in and transported along the motor neuron, and then deposited in the junction. However, recent reports in the literature have shown that changes in this junctional cholinesterase appear very slowly after the motor nerve has been cut. In these experiments, muscular atrophy was induced in rabbits by cutting all of the tendons around one ankle, leaving the motor nerve supply intact. The other leg served as a control in each animal. Control and experimental soleus and anterior tibialis muscles were examined histologically for cholinesterase at the neuromuscular junction at varying times after operation. In another series of experiments, atrophy was produced by spinal cord section, with the motor innervation to the muscles again remaining intact. Significant changes were observed in cholinesterase in both series of experiments, suggesting that these histological alterations are causally related to the induced muscular atrophy.

R.V. Coxon and M.A. Nassim (University Laboratory of Physiology, Oxford) have followed up an earlier suggestion in the literature that glucose depression of PAH extraction in the kidney may be due to a chemical combination between these two

substances. At the concentrations normally used in renal function studies, it can be shown that at least one product can occur from a reaction between glucose and PAH, and more than one may occur if higher concentrations of these reactants are used.

Pamela Holton and H.E. Jacoby (Dept. of Physiology, St. Mary's Hospital Medical School, London) have restudied the problem of the effect of adrenaline on gastric blood flow, histamine-induced gastric acid secretion, and gastric oxygen consumption in the dog. Histamine was infused intravenously at a rate of 2-3 μg/Kg/min. Once acid secretion had reached a steady level, adrenaline was infused in addition to histamine at a rate of 4 or 8 μg/Kg/min. Although the effect of adrenaline on gastric vascular resistance was variable (decreased in 5 tests, increased in 3 and no change in 5), venous outflow was increased in all experiments. This picture is complicated by the other cardiovascular actions of adrenaline at these doses. In most cases, adrenaline increased the rate of histamine-induced acid secretion and gastric oxygen consumption. In four experiments the data were such that it was possible to calculate the ratio of extra H^+ ions secreted to the number of extra O_2 molecules used. The average ratio in four experiments was 1.6, which compares favorably with other values in the literature determined on different animals and under different experimental conditions. (C.N. Peiss)

MISCELLANEOUS

Science Policy in Britain

As Chairman of the Council for Scientific Policy, Sir Harrie Massey (Professor of Physics, University College, London) has just submitted to Anthony Crosland, Secretary of State for Education and Science, Britain's first White Paper on the development of science in "an environment of relatively slow economic growth." Serving on the Council in addition to Massey are J.B. Adams (Director of Culham Laboratory), P.M.S. Blackett (President of the Royal Society), F.E. Jones (Managing Director of Mullard Ltd.), J.C. Kendrew (Laboratory of Molecular Biology, Cambridge), Sir Gordon Sutherland (former Director of the National Physical Laboratory), and a half-dozen other eminent scientists drawn from academic, industrial and government laboratories.

Created by the Science and Technology Act of 1965, this Council is charged with the responsibility of advising the Government on civil science policy with particular reference, naturally, to government spending. In its report, the Council attempts to delineate an appropriate role for such an advisory body and a mechanism for implementation of a national science policy. The Council treads carefully the narrow strait between the Scylla of mission-oriented research, where programs "may result in more elaborate solutions to problems which may have changed fundamentally," and the Charybdis of basic research, featured by uncertainity of payoff ..... "Because science is original, it is also unpredictable."

From the beginning the Council disclaims any responsibility, or indeed any talent, for assessing scientific merit of any individual research programs, which it feels are better left to service and research councils. Rather, Massey's group feels obliged to deal with the problem of maintaining an environment appropriate for research, as well as of assuring the government of an adequate funding and balance of scientific programs. Communication between disciplines and between nations engaged in similar research is also an area to which the Council has devoted much thought.

From accounts in the British press one would be led to believe that the sole item of interest in the report is a statement to the effect that the national economy cannot sustain the present rate of growth of research expenditure. Currently this rate is 13% per year, or approximately a doubling every six years. A more thoughtful perusal of this document, however, reveals that the Council merely intended to mention *en passant* that geometrical progressions of this type are not bounded. Thus, at some point in a nation's history a leveling-off of this growth must be expected -- even though, as apparently not understood by the press, the time may well not be now. Similar growth patterns appear to be well accepted at the present time both in the US and in France; indeed, children have a growth rate that would be alarming to those choosing to extrapolate the record of their first few months. (As for extrapolation based on teenagers -- Lord help us!)

Among problems dealt with in detail in the report, the need for confidence in long-range scientific support is paramount, for an agency which may suddenly impose an arbitrary ceiling upon expenditures may also terminate new programs in order to maintain those already well under way. This in turn would tend to drive the younger scientists to other countries. ("Committee warns of brain drain," headlines one newspaper.) The first goal appears to be greater flexibility, in particular a willingness to "redeploy" existing resources upon new projects.

With full recognition of the schism between those who wish to support research solely as an intellectual endeavor and those to whom "payoff" is the ultimate goal, three universal truths are offered. First, all cultural activity, however valuable

must draw upon a finite treasury, and as a practical measure, if the nation understands the kinds of payoff available, the purse strings may be less tightly drawn. Second, since science is not cheap, to support it below some critical level is to be extravagantly wasteful. Finally, one must recognize scientific interdependence; terminating one major field of investigation deemed no longer vital may unintentionally weaken another area of acknowledged importance.

The Council considers that its primary assignment is to advise on fiscal matters over the next three years and to establish mechanisms for studying in greater detail, and on a continuing basis, the fuller implications of the government's scientific policy. In this latter category, problems of education, manpower, increasing costs due to complexity of modern research, utilization of government laboratories, and international cooperation (e.g., CERN, ESRO) will provide focal points for individual studies.

Early in 1965 a report which received considerable attention in the local press gave the impression that the percentage of 6th-form students (roughly equivalent to juniors and seniors in our high schools) planning to major in science is diminishing. The Council's report now claims that the statistical analysis was erroneous and that, in fact, there has been no change in this proportion. With all due respect to the distinguished panel preparing this more recent report, we find its discussion on this topic mathematically inconsistent, and we quote the following two sentences for the reader's personal evaluation: " ... within a growing total of candidates eligible for higher education there had not been a significant decline in the proportion choosing to specialize in scientific subjects. There had, however, been a notable growth of social studies both at the expense of scientific subjects and the traditional arts; ...." (The underlining is ours.)

In many ways the most useful function that can be initially performed by such a task force is the gathering of facts. Among the numerous preliminary statistics presented in this document, the following may be especially noteworthy. Examination of expenditures over the past triennium shows that for the first time the fraction of the GNP devoted to research and development has not increased. The fraction of R and D work financed by the government has decreased over this period from 55% to 38.2% and the proportion of R and D work carried out by government agencies has declined to 25.4%, compared with 28.7% nine years ago. On the other hand the figure for universities has risen from 5% to 7.4%. Meanwhile industry has continued to spend about two-thirds of the nation's total R and D budget, although a smaller fraction of the funds expended have been provided by the government.

While the report is intended to be merely preliminary, a number of perplexing and immediate problems receive attention. Among these, the position of molecular biology in Britain earns a special section, for the Medical Research Council Unit for Molecular Biology enjoys a world-wide reputation and attracts researchers from all over the world. Nevertheless, the teaching of this subject has not grown in Britain, so that many workers trained at the Unit have chosen to continue their careers in the US rather than in Britain.

Throughout the report one theme striking close to home is played again and again. As described by Massey, the public's increasing awareness of the need for science -- culturally, socially, and economically -- may, ironically, prove the greatest threat to its full and complete development. "The temptation may have to be resisted to throw all our limited resources into the exploitation of present knowledge, thus cutting back our capacity to advance in the future."

All in all, this document is as pertinent, in our opinion, for the US as it is for the UK and should prove well worth anyone's time and 3/ (42¢).

(This report, entitled "Report on Science Policy," published by Her Majesty's Stationery Office, London, is available from the British Information Service, 845 Third Avenue, New York, NY, 10022.) (E.H. Weinberg)

Research Support in Italy

Prof. V. Caglioti, of the University of Rome, is presently the President of the Italian National Council of Research (CNR), roughly the equivalent of our NSF. He has kindly given me a fairly broad picture of the structure of Italian support of scientific research. It is summarized here, since it is likely to be of interest to the American scientific community. In 1963 the Italian Government established an interministerial committee (CIR) to rebuild and to augment scientific and technological research. Three times a year the CIR meets, and the President of the CNR presents to the Committee a summary of the current state of research in Italy and a statement of future needs. Plans for the expansion of scientific research are tied carefully to the governmental 5-year economic development plans. As in the US, the CNR is not the only governmental agency which supports research. Several of the ministries support basic research, as will be seen. As a part of the effort to coordinate research a minister without portfolio (Minister for Scientific and Technological Research) has been appointed. The relationships among the several supporting agencies are shown in the following diagram.

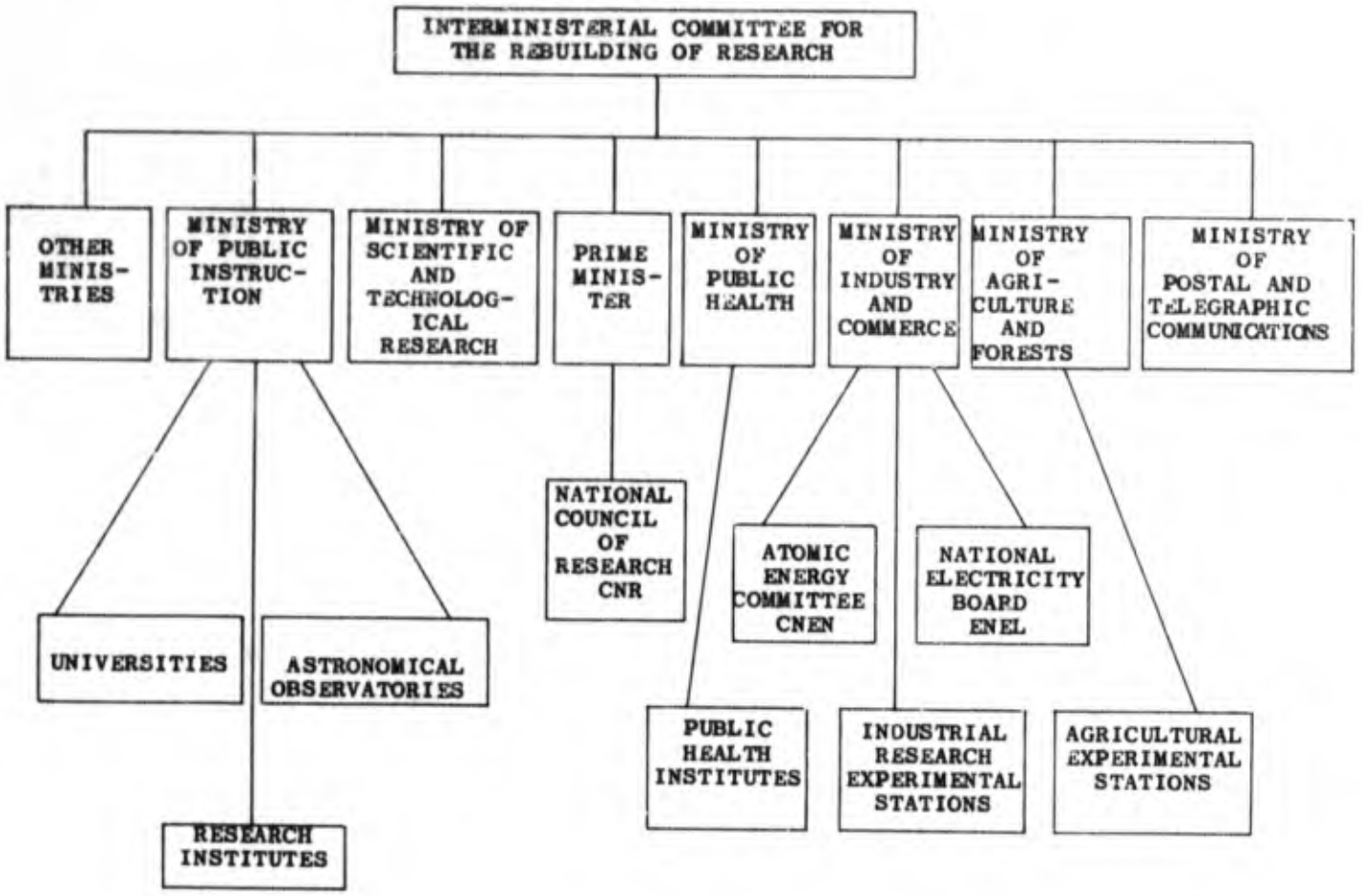

Table 1

The Ministry of Public Instruction, in addition to being responsible for basic salaries and supplies of all universities, budgets some funds for research, both within and outside the universities. All electric power in Italy is controlled by the government. The Ministry of Industry and Commerce is charged with responsibility for this aspect of the economy. It supports considerable research through the Geological Survey, the Committee for Nuclear Energy (CNEN), the National Committee for Electrical Energy (ENEL), Chemical Laboratories for Mines, and eight experimental stations for industrial research. The Public Health Ministry supports research in its Institutes of Public Health. The Ministry of Agriculture and Forests supports research in some of its 42 experimental stations.

An estimate of basic research expenditures in 1966, by discipline and by source of support, is summarized in the following table:

Millions of Dollars

	Public Instruction (Universities)	CNR	CNEN	Public Health	Defense	Agriculture	Others	Government Contribution to International Efforts	Totals
Mathematics	2.9	1	--	--	0.016	--	--	--	4
Physics	4.2	5.2	12.6	0.5	0.65	--	--	4.5	28
Chemistry	6.0	4.7	0.25	0.16	0.08	--	--	--	11
Bio-Medical	18	5.8	0.47	0.8	0.16	--	--	0.8	26
Geology	2	1.5	--	--	--	--	--	--	3.5
Agriculture	2.6	3.1	0.1	--	--	1	--	.75	7.5
Humanities and Social Sciences	20	3.9	--	--	0.13	--	--	0.1	24
Nuclear	--	--	29	--	1.3	--	--	24	54
Space	--	1.2	--	--	0.5	--	--	27.5	29
Technology	8	7.5	--	--	1	--	4	--	20
Interdisciplinary	--	3.9	--	--	0.37	--	--	2.5	6.8
	64	38	42	1.4	4.2	1	4	60	215

Table 2

Italy makes a significant contribution to international programs. It is broken down approximately as follows for 1966:

Program	Millions of $
EURATOM	23.6
ELDO	22.7
ESRO	4.9
CERN-AIEA	4.6
OCSE	1.3
OMS	0.8
UNESCO-FAO	0.75
Miscellaneous	1.2

The following five-year plan for internal governmental support of research is proposed:

	Millions of $				
	1966	1967	1968	1969	1970
CNR	38	47.5	70	90	100
CNEN	42	50	55	55	65
Public Instruction	63	85	103	124	146

Thus it can safely be assumed that CNR and the Ministry of Public Instruction will have substantially augmented budgets for the support of basic research in the future.

The CNR supports research by giving grants to institutes, study centers, and research groups. In practice, a professor who is also the director of an institute in a university is allocated space and a budget by the Ministry of Public Instruction. Basic salaries and supplies are included. The building upkeep of universities is the function of the Ministry of Public Buildings. The CNR may make a grant to the professor which enables him to add research staff to his group and to purchase capital equipment. National consultative committees recommend the allocation of CNR grant funds. There are 11 such committees: Mathematics, Physics, Chemistry, Biology and Medicine, Geology and Mineralogy, Agriculture, Engineering and Architecture, Law and Political Science, Economics, Sociology and Statistics, and Technology.

The CNR also maintains a few research centers outside the university structure; e.g. the National Center for Microwaves and the National Center for Atmospheric Physics and Meteorology.

The CNR has compiled some interesting figures comparing the support of research in some European countries with that in the US:

Country	1 GNP 10^9 $	2 Estimated Research Expenditure 10^6 $	3 Population (millions)	4 GNP per capita $	5 Research dollars per capita	6 % of GNP spent on research	7 col. 5 / USA col. 5 %	8 col. 4 / USA col. 4 %	9 col. 6 / USA col. 6 %
Sweden (1961)	13.4	220	7.580	1,768	29	1.04	30.9	56.6	54.7
UK (1962)	80.0	1,775	53	1,508	33.5	2.22	35.7	48.3	74
West Germany (1963)	81.6	1,710	57.865	1,410	29.5	2.10	31.4	45.1	70
France (1963)	67.8	1,370	48.133	1,409	28.4	1.6	30.3	45.1	67.3
Belgium (1963)	12.6	180	9.328	1,350	19.3	1.4	20.6	43.2	47.5
Holland (1962)	13.2	200	12.029	1,097	16.6	1.5	17.7	35.1	50.3
Italy (1965)	39.6	309	51.816	764	6.0	0.78	6.4	24.5	26
US (1963)	584	17,351	187	3,123	93.8	3.0	100	100	100

Table 3

(S.Y. Tyree)

Water Chemistry in Italy

Surely the physical and chemical properties of few waters have been determined as carefully as have those of the S. Pellegrino brand of mineral water, authorized for sale by the Ministry of the Interior of the Italian Government. In addition to being an excellent, cooling, appetizing, hygenic drink, it is "unrivalled for curing (1) uric diathesis: gout, gravel, stones in the bladder, kidneys and liver; (2) congestion and swelling of the liver from diseases of the stomach, intestines, infectious fevers, malaria and alcoholism; (3) diseases of the kidneys and albuminuria in uric acid diathesis; (4) gouty manifestations of the skin."

In support of the foregoing claims the analysis of the water, as certified by Prof. G.B. Bonino of the University of Bologna, is given below, as appears on the label.

Clear, colorless, odorless water, of pleasant taste

Solid Residue remaining at 180° C (from one liter, presumably)	1.1039g
Ammoniacal nitrogen	none found
Oxygen consumed by (presumably one liter) the acidified water	0.0003g
Alkalinity (cc. of 0.10·NHCl consumed per liter)	37.32
Temperature of the water at its source	26.0° C
Density	$D_4^{15} = 1.000305$
Index of refraction	$N_o^{25} = 1.33275$
Cryoscopic lowering	$\Delta t = 0.34°$ C
Specific electrical conductivity	$K_{25} = 1.46 \times 10^{-3}$ mho
pH	7.03
Activity of hydrogen ion	$a_H = 0.933 \times 10^{-7}$ mol/l
Radioactivity (The Scientific Staff of ONRL will be grateful to anyone who can tell us what a Mache is.)	3.01 Mache units

Substances dissolved in a liter of the water at 25° C.

Sodium	0.0496g
Potassium	0.0048g
Lithium	0.0003g
Calcium	0.2108g
Magnesium	0.0577g
Chloride	0.0733g
Sulfate	0.5665g
Bicarbonate	0.2277g
Phosphate	0.00007g
Silica	0.0109g
Iron and Strontium	traces
Total CO_2 (some added artifically), (again presumably per liter of water)	102.0cc. at 0°C, 760mm.Hg

Despite the "carefully controlled" properties of this mineral water, the writer did not find it in any way superior to ordinary tap water, as sampled throughout Italy. (S.Y. Tyree)

PHYSICAL SCIENCES

Ferrites at RVO-TNO

RVO-TNO, located at Blakte Van Waalsdord, The Hague, Netherlands, is a civilian laboratory administered by the Ministry of Science and Education, but most of the financial support is obtained from the Dutch military services. (Non-military research and development within the Netherlands is accomplished primarily by the five industrial giants: Royal Dutch-Shell, Philips, Unilver, AKU and BSM-Staatsmijnen. There are, however, indications that medium-sized and smaller industrial enterprises are increasingly making use of the services provided by RVO-TNO.)

Microwave research and development is carried out within the Physical Laboratory of RVO-TNO, and is under the direction of Ir. M.L. Toppinga. From discussions with him, this visitor learned that the microwave program includes investigations on radar cross section of targets, radar and optical reconnaisance, and electronic scanning of antennas. The program on electronic scanning is under the direction of Dr. J. Snieder, and his personal areas of interest include ferrite microwave components, antenna arrays, and diode phase shifters.

Dr. Snieder and members of his laboratory have made extensive studies on reciprocal phase shifters made with ferrites mounted in rectangular waveguides. Snieder has completed a comprehensive experimental program on the properties of various ferrite configurations at S-, C-, and X-bands. Phase shift and attenuation as a function of magnetic field strength, peak power handling capabilities, and effects of heating have been studied for virtually every commercially available ferrite material.

Permeability of ferrites increases with an increase in magnetic field. Therefore, one would expect phase delay to be increased if magnetic field is increased. Dr. Snieder reports that the converse of this occurs for the case of a thin slab mounted along a broad waveguide wall, that is, with an increase in magnetic field he observes a reduction in phase delay. Further, he has found that slab width controls the amount of negative phase shift, and maximum negative phase shift occurs for a slab width that is less than the waveguide width. Initially the thin slab was of interest because the ferrite material itself is in proximity to a metallic wall, and therefore the configuration would offer the advantage of better power handling capability (improved heat conduction).

The unexpected observation on phase change with increased magnetic field has stimulated detailed experimental and theoretical studies on microwave propagation in ferrites. A series of systematic measurements has been completed on phase shift versus magnetic field strength for various ferrite shapes, sizes and positions; waveguide height was also a variable. From these measurements a relationship has been found between ferrite location within general areas of waveguide cross section and specific elements of the permeability tensor. Snieder says that he can now explain, from theoretical studies coupled with results of the measurements program, the unusual phase change caused by an increase in magnetic field. The explanation involves effects of ferrite location on off-diagonal elements of the permeability tensor.

Snieder's laboratory is also engaged in the development of an electronic scanning pencil-beam antenna which operates at X-band. The antenna scans in azimuth; the scanner consists of 40 waveguide elements which form a horizontally mounted line source and illuminate a section of a half-parabolic cylinder. The principal plane beamwidths are approximately 2.7° and the sidelobes are down at least 20 db from the main lobe over a ± 40° scan sector.

Three scientists and three technical assistants are assigned to Snieder's group; two or three machinists (assigned to the shop) are used to perform the precision machine work needed. The laboratory is well equipped for ferrite measurements and antenna studies at S-, C- and X-bands. Snieder follows US literature closely and his research effort is now directed toward reciprocal latching ferrite devices.
(M.W. Long)

Symposium on Clutter and Radar Automation

This Symposium was held on 5-6 May at the Admiralty Surface Weapons Establishment in Portsdown, which is on the southern coast of England close to Portsmouth. The meeting was attended by nearly 100 delegates from British government establishments, universities, and industry.

The object of the Symposium was to study the operation of radar systems using automatic detection and automatic tracking in the presence of clutter. Subjects during the first day included characteristics of clutter returns from land, sea, weather, and angels; clutter suppression techniques were also discussed. The second day of the Symposium was devoted to the performance of automatic detection and automatic tracking radar systems with emphasis on the effect of clutter. Material with security classification up to Secret was presented.

In addition to the author, the US was represented by Mr. Carlos Nuese, an exchange scientist from the US Navy Electronics Laboratory currently assigned to the Admiralty Surface Weapons Establishment, Mr. Paul Fiske (Navy Electronics Laboratory), Mr. Stanley W. Graveline (US Army Electronics Command), Mr. Robert T. Hill (Bureau of Ships), and Mr. Dean D. Howard (Naval Research Laboratory).

The British government was represented by delegates from the Ministry of Defence (London), the Ministry of Aviation (London), the Admiralty Surface Weapons Establishment, the Royal Radar Establishment, the Admiralty Underwater Weapons Establishment, and the Royal Aircraft Establishment. British industries represented included Associated Electrical Industries, Ferranti, EMI Electronics, Marconi, Plessey Radar, Elliott Brothers, and GEC Electronics. British universities were represented by delegates from Birmingham, Leeds and Cambridge.
(M.W. Long)

London Conference on Large Antennas

The Conference on the Design and Construction of Large Steerable Aerials (for satellite communication, radio astronomy, and radar) was held 6-8 June 1966 at the headquarters of the Institution of Electrical Engineers, London. In addition to the IEE, the conference was sponsored by the Institution of Electronic and Radio Engineers, the Institution of Mechanical Engineers, the Institution of Structural Engineers, and the Institute of Electrical and Electronics Engineers.

During the Introductory Session, Dr. G.L. Hutchinson and Dr. H.C. Husband delivered survey lectures, entitled "A Review of Microwave Problems in the Design of Large Steerable Aerials," and "Mechanical and Structural Design Aspects," respectively. These lectures were followed by seven technical sessions: Electrical Design -- General, Profile Errors, Feeds, Performance Measurements and Radomes; Mechanical Design -- Mounts and Drives, Structure and Measurements; Control and Tracking Techniques. A total of 70 papers were presented and/or discussed.

The Institution of Electrical Engineers arranged for the Conference attendees to visit any of the following on 9 June 1966: Goonhilly Satellite Communication Earth Station - Cornwall; The Nuffield Radio Astronomy Laboratories, Jodrell Bank, Cheshire; The Royal Radar Establishment, Malvern, Worcestershire.

The Conference attendance was about 260, of whom more than 100 were non-British engineers representing 17 countries. Attendees from outside of Britain took an active part in the meeting, presenting about half of the papers.

The texts of most of the contributions were included in the Conference proceedings. Registrants received copies of this publication; additional copies can be obtained from the Institution of Electrical Engineers, Savoy Place, London, W.C. 2. If ordered from the US, the price is $13.50.
(R.C. Johnson, Georgia Institute of Technology)

PSYCHOLOGICAL SCIENCES

Applied Psychology at the University of Münster

Münster, the center of Westphalian culture, has two Chairs of Psychology at its University. Until recently, there was a single professorship, and the Department was headed by Prof. Wolfgang Metzger, well known for his significant role in the resurgence of experimental psychology in postwar Germany (ONRL-66-56, ONRL-96-56). Perhaps because of the unusually wide scope of research interests of the psychological faculty, the Department has divided into two sections, each headed by a man of professorial rank. Metzger still heads the division which covers general and clinical psychology; the other division is headed by Prof. Wilhelm Witte, and is primarily concerned with "applied" psychology.

Witte came to Münster via Heidelberg and Tübingen, where his best known work dealt with perceptual frames of reference. After a period of many years of research in this area, Witte has developed a mathematical model to describe the distributions of absolute judgments of visual, auditory and tactile stimulus categories. His research interests have apparently not changed materially since his move to Münster. Dr. H.J. Strüber, a member of Witte's department, is also working along these lines, with a heavy emphasis upon psychophysical scaling problems. Similarly, Dr. Herbert Kallina has a strong interest in scaling problems, including multidimensional scaling. His more applied research includes industrial safety and human factors in driving safety.

Dr. Ernst Müller, a PhD from the University of Michigan, has broad research interests in the social and industrial areas. These include management training, job satisfaction, behavior expansion, the analysis of propaganda, value and attitude change, and the relationship between self-actualization and work load. Müller also plans to participate in the near future in a cross-cultural study of birth order and achievement, suggested by French of the Institute for Social Research at Ann Arbor.

B. Zoeke, a research assistant, is undertaking a longitudinal study of the relationship between social adaptation and maturation and school achievement.

Dr. G. Haubensak's primary concern appears to be with general problems of research methodology, and more specifically in studies of perceptual illusions.

The research of Dr. Dieter Langheinrich aims at the development of predictors of academic success and analyses of reading difficulty. He has also conducted longi-

tudinal studies of aptitude of the Project Talent type, and more recently has become interested in the general area of computer simulation.

Dr. André Kohler is interested in the methodological problems of job analysis, the prestige order of occupations, and related topics. One of his studies, a large-scale analysis of the printing industry in West Germany, was the only study described in me in any detail. Supported by the federal government office which deals with employment security, the study covered all aspects of the printing industry from one-man workshops to large plants employing several thousands of people. The applied goal of the research was to provide basic data for vocational counselors, vocational teachers, trade unions, rehabilitation workers, and for the development of selection tests. The more basic goal was, hopefully, the attainment of insights into the many methodological problems of job analysis. Many data-collection techniques were employed, including observational techniques, interviews, and a variation of the critical incident technique. Information was collected from all classes of workers. Apprentices, students, skilled workers, the entire hierarchy of authority, and the families of workers were included in the sample. The Münster faculty considers this to be a pilot study despite its size. They feel that they have delineated the techniques required for a thorough analysis of an industry, but they will not continue with the analysis of other industrial jobs. Some experimental testing and criterion-development was conducted during the study, but the analyses of these are not yet complete. One finding of some interest which was cited, however, suggests that aptitudes usually believed to be critical for success in the printing occupation were not supported by the findings. A very low correlation, for example, was found between skill in spelling and mathematics and scores on a performance test of printing skill.

The facilities of the applied psychology division include considerable numbers of psychomotor testing apparatus, maintained with unbelieveable neatness. Whether its primary use was in research or in teaching was not disclosed to me.

Although the writer has only a limited basis for comparing Münster with other German universities and research centers, the program of the applied psychology division appears to rank high. One gets the impression that the staff is vigorous and moving forward energetically on a broad research front. There was certainly no indication of the insularity that some German universities are reputed to demonstrate. Considerable knowledge about the work of their research counterparts in other countries, particularly in the US, was displayed by the staff. Another refreshing aspect of the situation, which may be indicative of a trend in European educational mores, was the easy, informal relationship which was readily evident between the professor and his staff.
(J.A. Nagay)

NEWS AND NOTES

Dolphins Again

As a solution to the problem of driving ambulances at the London Airport in fog, I suggested a year ago the use of the dolphin, Turciops truncatus (ESN-19-3, p. 106). I might at that time have gone on to quote Lord Amory who, on being told by the First Sea Lord that the Royal Navy was conducting experiments on the skill and intelligence of the dolphin, remarked that "if mammals could take over from men in some naval duties and thus cut public expenditure, then well and good."

And now the London Times heads an editorial: "The dolphin has done it again." According to an Egyptian newspaper report, a school of dolphin rescued a man from drowning in the Gulf of Suez, carrying him to shore on their backs while fighting off a pack of sharks. In support of the credibility of the tale, the classics are quoted. It seems that Arion, the inventor of the dithyramb*, was similarly saved from the sea by a dolphin. While on a voyage from Sicily to Corinth, Arion was tossed overboard by the sailors, who, however, had been persuaded to let him sing a last song before taking the plunge. The song had so enchanted a passing dolphin that it carried him ashore on his back. The credibility of this tale is attested by a bronze statue of Arion and the dolphin in Taenarus.

It thus seems that the dolphin may be possessed not only of intelligence but also of a spirit of humanitarianism and an appreciation of music. There are also reports of an investigation under way to study the dolphin's system of communication, in the hope that it may have some bearing on the problem of communication between humans and whatever kind of creatures may live on other planets. Dolphins to the rescue!
(N.W. Rakestraw)

* Beat you to it! I had to look it up, too. A dithyramb is a wildly emotional song, particularly "a wild choric hymn in honor of Dionysus."

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Chocolate, by any Name

Specialists in the invention of governmental "double-talk," than which there is scarcely anything more confusing, should observe a recently published British example which will be difficult to surpass.

There is on the market a chocolate-flavo(u)red concoction named "Flake." The Government has pointed out that to comply with the Food Labelling Regulation it must be labelled "convoluted milk chocolate," and this must be done in letters of such size that "the smallest rectangle capable of enclosing each letter, apart from the initial letter, shall be not less than nine-sixteenths of the area of the smallest rectangle capable of enclosing the largest letter, apart from the initial letter in the word Flake." (N.W. Rakestraw)

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A Revolution in Fuel?

The Discovery of natural gas beneath the North Sea off the British coast last year has led to important consequences. The initial find by British Petroleum was followed by the discovery of even larger fields by other interests, until now it seems more than possible that the supply of gas will soon exceed the normal needs of the country. This would make possible the diversion of gas into industrial fields hitherto served by other fuels. The pressure on the production of coal and the importation of oil could be relieved. Reactions are already appearing from the coal industry, which is even now in a bad way, saddled with the operation of uneconomic pits in Scotland and Wales, and fearing the possible social consequences of closing them down. As for petroleum, a touchy situation exists as this is being written; the seamen's strike is interfering with tanker deliveries. If the likely quantities of gas are actually realized, a whole new fuel policy for Britain may result.
(N.W. Rakestraw)

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Dr. Patrick B. Kennedy, Professor and Head of the Department of Mathematics of the University of York, died 8 June 1966 at the age of 36. His significant researches in the theory of analytic functions, subharmonic functions, and Fourier series earned for him an appointment to the chair of mathematics at the Cork division of the National University of Ireland in 1956, at the age of 27, and in 1963 he became the first occupant of the chair of mathematics at the new University of York.

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Epilogue

Sixteen months ago I wrote my first comments on life in Britain; now I find myself thinking of an old sea chanty, a haunting song which brings back memories of the Gulf Stream in the moonlight, even when sung in reverse, as I must now sing it.

Rolling home, rolling home,
Rolling home across the sea.
Rolling home to dear old England,
Rolling home dear land, to thee.

I have often found myself thinking, when traveling on the Continent, "When I get home to London ...." Where you can't tell a "mod" from his moll, or a "trog" from a tramp. Where Africans come to be civilized at the London School of Economics while the younger British generation performs fertility dances, on television, to the wails of shaggy-maned crooners.

There are any number of reasons why an American should feel at home in Britain. First, of course, because he can understand the language better than in other foreign countries. Not a great deal better, perhaps, but at least a trifle. And then, the people look so much like those at home. Why, this is the very land of origin of the beatniks. As a speaker said recently at a social luncheon:

"The beatnik is a symbol that things can be done. It was a spontaneous movement which had no intentions of being exported. It was something a group of people created for the enjoyment of people in Britain ..... If we allow this kind of Britain to come to the fore we shall not be considered an old country, in spite of our traditions and the paraphernalia of processions and castles."

"Give the British lion a Beatle haircut and transform the foreigners' image of Britain," he said.

Of the contrasts to be found here my favorite has to do with table manners. You can always recognize an American at table, with his fork in his right hand. As for me, I long ago learned the efficiency of the knife in the right and the fork in the left, whereby the toughest steak can be managed adroitly. But I balk at the English custom of piling potatoes and peas on the backside of the fork. (If one cares to argue which is front and which is back, one need only observe where the maker's name is stamped.) To my mind, this hideous habit is no less unsightly than to shovel peas and potatoes with a knife. In 1971 Britain is to follow the Australian example of turning to decimal coinage, is committed soon to go onto the metric system, and no doubt

will eventually emulate Sweden in changing its rule-of-the-road to the right. But, alas, I do not expect to live long enough to see the British fork turn right side up! (N.W. Rakestraw)

Technical Reports of ONRL

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ONRL-17-66	Notes on Medical Education and Physiological Research in the United Arab Republic (Egypt) by C.N. Peiss
ONRL-18-66	Programmed Instruction in Military Training in the NATO Nations by J.A. Nagay
ONRL-19-66	The Life and Activities of a Physical Oceanographer (John C. Swallow) by N.W. Rakestraw

The following conference report is releasable to European scientists.

ONRL-C-10-66	Third European Conference on Experimental Social Psychology, Royaumont, France 1966 by J.E. Rasmussen

Prepared by the Scientific Staff
Submitted by P. King

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

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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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