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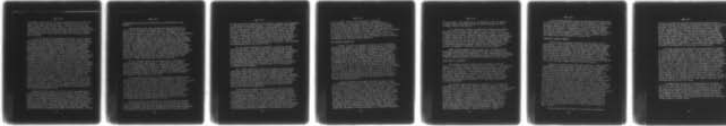
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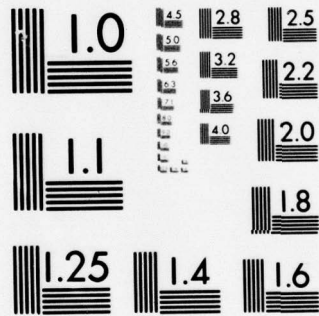
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OBSERVATIONS ON PSYCHOLOGICAL RESEARCH IN NINE
BRITISH UNIVERSITIES

JAMES W. MILLER

22 December 1976

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report describes the results of visits to the psychology departments of nine universities. A brief survey of interests in the social sciences in the UK is included. The information is grouped into five categories: Ergonomics, Aids for the Handicapped, Vision and Perception, Man-Computer Interaction, and Other Areas of Psychology. In addition to describing specific psychology departments and research programs, comments are made about the direction of psychology in the UK and where, in the opinion of the author, its weaknesses and strength lie.		

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OBSERVATIONS ON PSYCHOLOGICAL RESEARCH IN NINE BRITISH UNIVERSITIES

The purpose of this report is to summarize and comment on behavioral sciences in the UK. The information on which these observations are made was obtained from visits to the following organizations over a 16-month period.

Applied Psychology Unit, Cambridge
University of London (Birkbeck College)
Loughborough University of Technology
University of Newcastle upon Tyne
University of Oxford
University of Sheffield
University of Stirling
University of Sussex
Treforest, Glamorgan Polytechnic

It is recognized that these organizations are but a fraction of those offering research and training programs in psychology, and hence any inferences drawn must be considered within this limited framework. For example, the 1974-75 edition of "Scientific Research in British Universities and Colleges, Vol III for Social Sciences" lists 73 universities and 24 government departments and institutions that offer programs in psychology. Under each university cited is a list of faculty members and a sentence describing each member's interest or interests. There are 56 pages of such information on university programs in psychology. To get a general idea as to the areas of interest I categorized them as shown in Table I. When adding the items contained on every third page of the 56 pages, I found that there were 707 items cited. Accepting the fact that some would quarrel with my 19 categories, (which were based on terms used in the listed items), Table I is a summary of the stated fields of interest.

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Table I

Psychological Fields of Interest in British Universities

<u>Field of Interest</u>	<u>N</u>	<u>% of total</u>
Psychological	75	10.6
Social	64	9.0
Learning	64	9.0
Language	58	8.2
Personality	49	6.9
Child	45	6.4
Memory	41	5.8
Vision	41	5.8
Speech and hearing	37	5.3
Training	36	5.1
Models and Theory	35	5.0
Comparative	31	4.4
Abnormal	31	4.4
Perception	28	4.0
Industrial and Ergonomics	21	3.0
Experimental	15	2.1
Miscellaneous	15	2.1
Psycho-pharmacology	13	1.8
Tests & Measurement	8	1.1

Not having similar earlier data, I cannot determine whether there have been changes in emphasis over the years. The data are intended only to give a picture of the breadth of research in progress. Numerous related programs are offered under other titles such as psychiatry, sociology, information science, etc. When one considers that Volume III alone has 844 pages listing programs in the social sciences, the extent of training possibilities is indeed impressive.

Because my responsibilities did not permit me to restrict visits to universities in the UK, I chose to visit a few of those departments of psychology in which work was being conducted in areas in which I had some background. Therefore my visits did not necessarily coincide with the areas in which the most work is going on as shown in Table I. For purposes of this report I have chosen to place my observations in the following five categories: Ergonomics, Aids for the Handicapped, Vision and Perception, Man-Computer Interaction, and Other Areas of Psychology. These categories of necessity overlap and could, indeed, have been labeled in many ways.

ERGONOMICS

As one would expect, the size of the departments in which psychology programs are offered varies widely from one university to another. Further, psychological programs are not always found within psychology departments. For example, at Glamorgan Polytechnic (Pontypridd, Wales) Mr. Neil Thomas is running virtually a one-man effort in ergonomics within the Department of Mechanical and Production Engineering.

Thomas is in the process of building up the course in ergonomics and expanding the research program. The facilities, which occupy several rooms, feature one rather large room equipped with a number of excellent demonstrations of both basic and applied ergonomic principles and practices. Most of these are dynamic demonstrations which permit the student to serve as both subject and experimenter. Technical areas addressed include thermal stress (primarily hyperthermia); auditory studies involving the use of acoustic chambers and audiometers; visual tasks such as color perception, visual acuity and displays; physical anthropometry; work physiology including bicycle ergometers; and various apparatus for measuring pulmonary function. The practical approach to problems, which typifies many European ergonomic laboratories, results in studies which produce data that often have immediate applicability. A study completed in June 1975 entitled "A Comparison of Reactions to Industrial Protective Clothing" typifies such an approach. The objective of this study is the assessment of the effects on industrial workers of wearing protective clothing in excessively warm environments. Normal clothing and five protective clothing assemblies, four of which covered head and body, were tested on separate days for five cycles. Each cycle was divided into 20 minutes of work and a 5-minute rest period. Patterns of increasing heat strain, measured by heart rate, body temperature and subjective evaluation were observed for all protective assemblies. The times required for return to normal levels of all these measurements were recorded. It was found that the protective clothing tested did not permit the parameters measured to return to normal levels during existing rest periods. The study concluded with specific recommendations as to the wearing of protective clothing in hot and cold industrial settings.

In addition to his research and teaching responsibilities, Thomas has made a significant effort to learn of ergonomics efforts in other parts of Europe, particularly in the Eastern Bloc. In this regard, during the period April to July 1975, he made a 13-week trip throughout Eastern Europe covering 10 countries, some being visited more than once. The results of this trip were summarized and presented at the "Second International Symposium 'Man-Machine System and Environment'." Dubrovnik, Yugoslavia, 16-17 October 1975. (See ESN 29:12, 554-555)

In contrast to this virtually one-man department at Glamorgan, the Loughborough University of Technology, Leicestershire, has an extensive ergonomics program. The Department of Human Sciences of which this program is a part, was founded in 1970. Now under the direction of

Professor Brian Shackel, this Department, offers undergraduate Honours-degree courses in ergonomics, human biology, and psychology as well as postgraduate degree courses in ergonomics and human biology. Although ergonomics, as a specialty has existed for over 25 years, formal university degree programs have existed for a relatively short time. The research commitments of the staff at Loughborough and the close liaison they maintain with industry, medical and para-medical organizations, charitable foundations, and with the community at large, are considered to be of vital importance in maintaining a challenging undergraduate program.

The Department has a full-time staff of 21, which is augmented, on a part-time basis, by 4 Research Fellows, 10 members of the research staff of the University, and 14 members of the Institute for Consumer Ergonomics Ltd. The principal groups in the Department are: Human Sciences and Advanced Technology (HUSAT), Vision and Lighting Research, Biodynamics and Vibration Research; Design Ergonomics Center; Institute for Consumer Ergonomics Limited; and the Aviation Ergonomics Center. There are several programs underway which fall into the general category of ergonomics.

In 1971, while a graduate student, Mr.D.L. Mitchelson began a program designed to develop instrumentation for making on-line recordings of the angular displacement, velocity and acceleration of limbs and body segments. The reason for this interest was to make it possible to analyze limb and body movements in relation to work skills; design improved orthotic devices; assess the progress of physiotherapy; evaluate the results of orthopedic surgery, and obtain data on body movements for a variety of other purposes. The instrumentation which resulted is referred to as CODA (Cartesian Optoelectronic Dynamic Anthropometer) which, in effect, is a polarized light goniometer.

The system works as follows: Light emitted from a dc source is polarized by transmission through a disc containing a linearly polarizing filter. The disc is made to rotate in excess of 125 revolutions/sec. The light is received by a transducer which consists of a pair of matched photocells in front of which are mounted polarizing filters with planes of polarization fixed at 90° to each other. The outputs from the two photocells are connected in opposition, consequently any nonpolarized light incident on the transducers is rejected. The signal produced by the polarized light, whose plane of polarization is rotating, is sinusoidal and of a frequency twice that of the revolution rate of the disc.

Photocell transducers may be mounted on any of the relevant limb and body segments of the subjects under study to produce simultaneous angular displacement, velocity and acceleration outputs, i.e., as the limb moves, the mounted photocells move, altering their output because of the change in plane of polarization. Mitchelson demonstrated this technique during my visit. In this case a subject had two pairs of photocells mounted on his right leg, one below the knee and the other above. The subject walked on a treadmill in front of the rotating polarized source (daylight has no

effect on the recordings) at a distance of about six feet. A graph showing a continuous recording of the angular movement of the leg was produced in realtime on an analog display, and on demand could instantly be reproduced on hard copy. The instrumentation, which is easily portable and appears to be easy to use, has been packaged in cooperation with a local electronics firm and will soon be available commercially.

The system is being modified to permit three-dimensional recordings of body movements. In the new system the photocell transducers worn by the subject will be replaced by miniature gallium arsenide injection lasers which emit short pulses of infrared light. Circuitry is required (worn by the subject in a lightweight battery pack) to provide the lasers with the short high-current pulses which stimulate the emission of light. Three electronic cameras are used to detect the output of the lasers worn by the subject. The output of two of these cameras is used to determine the position of the lasers in the X and Y planes. The third camera is placed centrally between the other two and is sensitive to vertical movement only. The outputs of the cameras so-produced are proportional to the true XYZ coordinates of the lasers and do not contain errors equivalent to the parallax errors which occur in conventional photographic recording. This system will permit the recording of 360° turns and similar movements without the subject getting entangled in a mesh of wires, as would be the case if the lasers were attached to stationary equipment. This program has been described in detail because it is a beautiful example of an idea developed in an academic environment being carried through to fruition, including the marketing of a commercial device that could be a major contribution to the treatment of patients handicapped by injury or surgery, improved design of orthotic and prosthetic devices, athletes wishing to increase their efficiency through the analysis of body movement, and to scientists wishing to conduct dynamic anthropometrical studies.

A related study, also at Loughborough, is one under the direction of Dr. J. Altha which concerns the influence of heart movement on postural movements. In addition, Altha is experimenting with various types of knee prosthetic devices with the objective of developing one with full freedom of movement. Altha is using the polarized-light goniometer described earlier as a means of determining the efficacy of the prosthesis.

Another active section at Loughborough is the Biodynamics and Vibration Research Group. I had the opportunity to talk with Mr. J. Sandover who, over the past few years, has been responsible for an extensive program designed to measure the effects of mechanical vibration on human performance, comfort and health, especially in the area of transportation. A study currently underway involves laboratory simulation and real-world measurement of the effect of vibration on truckdriver fatigue, general condition, and work-rest cycles. In addition to vibration, measures are being obtained relating to cab temperature, noise levels, and seat comfort. Several parameters are being examined including heart rate, body temperature, day vs night

shifts, etc. The Biodynamics Laboratory is well equipped to do this work and contains vibrators capable of producing vertical movements of up to ± 12 cm per stroke, a vertical impact device capable of accelerating up to 100 m/sec^2 , and extensive instrumentation and computer support equipment.

An interesting ergonomics study is underway within the Department of Occupational Psychology, Birkbeck College (University of London) entitled "Human Factors Study of Marine Pilots." The study under the direction of Miss P. Shipley, although being conducted primarily by Miss A. Spencer, was initiated as a result of dissatisfaction expressed by marine pilots with their conditions of work and their concern for the safe guidance of large vessels operating in inland waters. The overall objective is to "assess piloting activities for workload and stress and to subsequently provide (and assist in the implementation of) recommendations for the alleviation of such problems as are found to exist." Information is being obtained both by simulation and by conducting field studies involving actual observation of operations. The two-year study (which is now at the midway point) is being supported by various piloting organizations through a contract with the Department of Industry. The 55 pilots participating in the study all received a thorough medical examination and will be monitored medically during field observations. A workload measurement package has been developed for field use that can be employed on a non-interference basis. In addition a daily log of work and leisure time activities is being kept. This information when coupled with that obtained from questionnaires should provide a rather complete picture of piloting activities which according to the investigators has not been available previously.

The Medical Research Council (MRC) at the University of Sussex, under the direction of Professor W.P. Colquhoun has an interesting program which among other things includes studies of circadian rhythm, vigilance, watchkeeping schedules, and general human performance in stressful situations. In cooperation with the Environmental Medicine Unit (EMU) at the Institute of Naval Medicine, Portsmouth, Colquhoun has been conducting an extensive series of studies of vigilance performance as a function of watchkeeping schedule. The EMU has the capability of housing up to 12 subjects for periods of 90 days in a carefully controlled closed environment. The Unit was designed to study long-term toxicological problems arising during extended nuclear submarine patrols (see ESN 30-7: 299-301). During a recent experiment in which the level of CO was varied, 7 groups of subjects (6-9 subjects per group) were confined for a period of 18 days in the EMU chamber. During this time the subjects were examined both medically and psychologically.

The psychological studies were placed into one of six groups. Group 1 tests were given four times daily and included a letter-cancellation test, double-digit span (short-term memory), and a memory and search task. These tests were taken simultaneously by all subjects, each of whom had a separate test booth. The Group 2 test was called LOGIT, a strategy and reasoning test, which has been used in a number of environmental conditions.

The tests in Group 3 were designed to measure manual dexterity and visual sensitivity. Those in Group 4 assessed neurophysiological performance and measured finger tremor and body balance. The Group 5 test was an auditory vigilance task in which the subjects were required to detect a signal in a series of similar signals that tended to mask it. The writer was there while this test was being administered and found the task to be both difficult and tedious. The sixth Group was really a selected battery of questionnaires designed to record sleep patterns, motivation in an isolated state, personality, and hostility. While no significant differences were found among the psychological tests as a function of the level of CO, some very interesting results were observed as a function of time over the 18-day period. Such data are particularly valuable because most vigilance and watchkeeping data obtained previously by others are for much shorter periods (usually one to two days). The EMU data show a daily fluctuation in vigilance performance that persists for the entire 18 days. For example, when test data are obtained at 0800, 1200, 1600, and 2000 hours, the performance of the subjects improves at noon compared to the 0800 data, then drops at 1600 only to return to the 0800 level at 2000. The exception to these findings, according to Colquhoun, are the data for the short-term memory tests. In this case the performance drops at noon, drops further at 1600 and then recovers at about 2000. These latter data were consistent for the entire 18-day period of exposure. This discrepancy between short-term memory and performance on other tests has been observed by Colquhoun in other experiments in which performance was measured following a rapid move by the subjects from one time zone to another.

A particularly interesting finding mentioned by Colquhoun was that certain personality factors seem to consistently affect vigilance performance. He placed the subjects in the EMU study into four categories based on personality test data: 1. Unstable introverts, 2. Stable introverts 3. Stable extroverts and 4. Unstable extroverts. There is a low but consistent positive correlation showing that Group 1 performs better in the morning, that they consistently have higher temperatures in the morning, are consistently most affected by drastic changes in time zone, are most affected when changes are made in daylight saving time, and in general they always seem to be at the extreme end of these and other continuums. The message here seems to be that when selecting personnel for watchkeeping or vigilance tasks, personality measures should definitely be included in the psychological test battery. Colquhoun is continuing to examine these parameters and hopes to re-examine data collected in previous studies to see if the trend is consistent. As consultants to EMU, Colquhoun and his three colleagues are in a good position to observe subjects in these unique long term studies.

Other studies falling under the general label of ergonomics are underway in many locations in the UK. For example Dr. Ivan Brown (Applied Psychology Unit, Cambridge) is studying the skills and attitudes of young drivers. Parameters under study include the effect on accident

rate of the perceived seriousness of an offense, the severity of the sentence, the probability of getting caught, and hazard perception. Brown also is attempting to compare eye-movement patterns of young and old drivers. These studies of driver behavior and driving skills are part of a large program being supported by the Department of the Environment through the Transport and Road Research Laboratory. Those interested in this area should contact Dr. Brian Hills at this Laboratory, Crowthorne, Berkshire, England.

Brown and his colleagues are also involved in ergonomic investigations in cooperation with the British Postal System in such areas as visual problems of sorting, the design of sorting keyboards and related problems. Dr. J. Long, also of the APU, is working on the analysis of keyboard skills in such occupations as mail sorting and telephone switchboard operating.

AIDS FOR THE HANDICAPPED

Research related to the development of aids for the physically handicapped is being carried on in several universities throughout the UK. This work, which could be classified either as ergonomics or physiological may be found in a variety of departments, i.e., engineering, biomechanics, psychology and, of course, medical.

While visiting the Social and Applied Psychology Unit, University of Sheffield, I had the opportunity to talk with Dr. Ann Harrison about her work with spastic patients. The objective of her work is to develop methods of enabling spastic patients to achieve better neuromuscular control. A feature of spastic muscles is their hyperreflexia, displayed in the exaggerated tonus of severely affected muscles and the abnormally strong resistance of mildly spastic muscles to brisk, passive stretch. Harrison and her colleagues have shown that spastic individuals are able to learn to control fine levels of neuromuscular activity when they are provided with electromyographic (EMG) feedback. This feedback can be either in the form of a tone or presented visually using a meter or cathode-ray tube display showing the waveform of the electrical impulse resulting from a particular movement. It is this latter technique that Harrison is currently using. She is finding that, when performing radial arm movements, a spastic patient provided with visual feedback of EMG signals can learn to curb overshooting. This indicates that they are capable of suppressing at least some forms of reflex responses. The end result is a smoother and more controlled movement. While this program is still in the experimental stage, Harrison hopes that it can lead to the development of specific training programs for spastics. Similar work of Harrison's recently has been published in the *J. of Human Movement Studies*, Dec. 1976 in an article entitled "The Hollingsworth Illusion of Movement."

Examples of other work designed to aid the handicapped include the development of stabilized walking devices by Mr. D.C. Witt of the

Department of Engineering, University of Oxford (ESN 29-5:226-227) and Dr. Jack Edwards, Head, Biomedical Engineering, University of Surrey. Together with colleagues they have developed a prosthetic knee joint which locks when straight, but permits a limited rotation when bent. This latter action permits the wearer to have a motion much closer to the natural motion of the knee. Such developments as these result from interdisciplinary studies involving engineering, physiology and anthropometry. The technique developed by Mitchelson described in the previous section should aid in the evaluation of such devices and in the training of patients to use them properly.

An interesting program concerning non-visible handicaps of children and their effect on parent-child relationships is being conducted at the University of Stirling by Dr. Ivana Markova. Problems of this sort are becoming increasingly manifest in recent years because of the capability of medical science to control and arrest diseases which formerly were considered incurable and/or led to early death. The first phase of this project began about three and a half years ago when Markova started looking into the psychological aspects of hemophilia in children between the ages of three and five. Because of the insidious nature of this disease and its ever-present danger, there is a strong tendency of parents to be overprotective. Markova is particularly interested in this aspect of the problem.

After the names of hemophiliac children have been obtained from various hospitals, the parents are contacted and their cooperation sought with respect to having the child take part in a program of study and counseling. Twice a week for two weeks the child and mother come to the University for a one-hour "play" session in the child study unit. During this hour the mother and child play together in activities which involve the use of large building blocks, pasting and cutting with scissors, and cutting modeling clay with a knife. These tasks are specifically selected because each presents a potential hazard to the child. All activities are visually observed through a one-way glass and aurally by an open microphone attached to the mother and are recorded on video tape. A physician also is in attendance if the child is a severe hemophiliac. In the room are two normal children of the same age doing the same thing with student instructors so that the afflicted child won't feel singled out. The mother is fully aware of all these arrangements.

Although the project is still young, the work has attracted a great deal of attention, and there are plans to expand the program to include other non-visible afflictions such as hepatitis, asthma, and diabetes. An interesting observation mentioned by Markova is that children with such diseases seem to establish friendships on the basis of kindness shown to them by other children rather than common interests. The overall purpose of this program is to gain understanding of the problems such that counseling techniques can be established to deal with them at an early enough age to prevent severe personality maladjustments from developing.

Another research program, involving severely mentally handicapped young children, is being carried on by Dr. Glyn Thomas, also at the University of Sterling. The purpose of this study is to develop play materials for children with a chronological age of up to 12 years but with a mental age of less than 24 months. The play materials (toys) for these severely handicapped children need to be different from those of normal children both with regard to sturdiness and character. For example, a 12-year old can readily demolish toys designed for the normal two-year old. Thomas is finding it necessary to work with the children as a group in a ward (40-60), rather than individually, in order to achieve a mutual reinforcement of behavior change. Otherwise, a single child when returning to a non-participating group will revert to the level of the group.

VISION AND PERCEPTION

In browsing through university catalogs as well as during visits to individual departments I could not help but note the large number of research programs related to perception or the visual processes. This is reflected in Table I where it is seen that when the categories of vision and perception are combined it accounts for 9.8% of the total. A number of visual experiments are underway at Loughborough University of Technology under the direction of Mr. P.T. Stone. Some are concerned primarily with the effects of light on various human functions including perceptual responses, performance characteristics, attitudes, and physiological and biochemical responses. A long-term study recently completed was designed to determine the effects of high intensity light (capable of producing discomfort glare) on performance. Size of critical detail resolvable, and contrast required, were among the variables measured. The relationship between age and sensitivity to discomfort glare also was studied. It was found that visual performance generally is unaffected by discomfort glare, at least within the bounds of the parameters measured. Throughout the glare studies, the light levels varied over a range of 1000 to 11,000 lux. A visual study currently underway is concerned with the controversial issue of whether to put windows in buildings. Although most people feel that windows are necessary they are always hard-put to give tangible reasons. Interestingly, this research is being sponsored by the Glass-in-Buildings Committee of the European Glass Manufacturers Association.

Another study of some interest is also being conducted at the University of Sterling by Messrs. M.A. Sinclair and A. Gale. These investigators are recording and analyzing eye-movement patterns of female lace inspectors in a local lace factory. These mature ladies have the difficult and tedious task of detecting mistakes in machine-produced lace tablecolths, napkins, etc. They are capable of finding 30 to 40% of individual missing threads and imperfections in patterns, working for hours on end. Sinclair and Gale are utilizing an eye-movement apparatus

that permits them to record the visual scanning patterns of these fine ladies under normal working conditions. They mount a mirror on the edge of work table such that the image of the eyes is reflected into an eye-movement recording camera, hence to a video tape record/computer combination such that the scanning patterns (utilizing the corneal reflex) are displayed in real time. While the inspection of lace, in itself, may not be pertinent to other specific tasks, the recording techniques are of interest.

Dr. W.R.A. Muntz of the Department of Biology, at the University of Stirling is conducting research relating to vision of fish. Muntz, has for the past few years investigated the vision of such fish as rudd (a member of the cod family), trout and various fishes of the Amazon. He is continuing his studies of the rudd and currently is conducting experiments relating to color perception. In these experiments the fish is conditioned to respond to a light by previously associating the light with a shock (standard Pavlovian conditioning). The response is a 5-sec cessation of breathing. The fish, which is constrained, is subsequently presented with lights of various colors and the responses measured. In other experiments, the rudd's innate escape response when presented with overhead moving stimuli has been used as a measure of whether the fish is sensitive to objects of various colors or shapes. In general the results of such experiments are not conclusive. As Muntz points out, a wide variety of spectral sensitivity curves can be obtained on fish, depending upon the experimental conditions. Some of the data also imply that there are quite complex interactions between the nature of the task and type of sensory coding that occurs. For example, the rudd seems able to respond to stimuli based on color, shape or contrast depending upon the conditions. According to Muntz, "although there is more known about the vision of the rudd than any other fish, all experiments have been conducted in the laboratory and may not, in fact, relate to how the rudd behaves in a natural environment." An excellent summary of such work is in a chapter by Muntz in *Vision in Fishes* (Ed. M.A. Ali, Plenum Pub. Corp., NY, 1975). These kinds of studies, while very basic in nature, could provide information which may in the future become valuable with respect to the development of new techniques for the raising and harvesting of fish.

Additional visual studies at Stirling include some experiments on human visual perception being carried out by Dr. William A. Phillips. These studies pertain specifically to visual memory. His principal interest is in examining the difference in information processing and sensory storage between short-term (usually a few seconds) and long-term memory. In his current investigations subjects view 1000 pictures for one second each and then view the same pictures again days or even weeks later along with pictures not previously seen. Phillips is finding a 90% recognition, i.e., correctly recognizing pictures already seen. The results are being compared with memory for verbal material. Phillips

has published several articles describing his previous work on this subject.

Other studies of the visual processes are being carried out by Dr. D.R. Hiles (University of Sussex) who is interested in short term memory (up to 30 seconds) for visual material. For example, in one experiment the subject is presented with a series of letters and subsequently shown a single letter and asked if it is in the series. The letters are varied in terms of upper or lower case in an effort to learn whether the subject is remembering the letter itself or the actual shape presented. Hiles also is studying amnesiacs to determine whether their memory problem is one of actual memory storage or of accessing stored material when desired. His preliminary results indicate that it is an access problem. In some of his experiments he had amnesiacs view pictures in which objects (such as a dalmatian dog) were buried in a complexity of dots and random patterns. Once the dog is perceived, the normal person can see it instantly upon viewing the same picture again. Although the amnesiacs would forget ever seeing the overall picture at all, they did instantly see the dog within the picture, indicating that the memory trace had been stored initially. Further work along these lines is continuing.

Dr. A.M. Treisman (University of Oxford) also is interested in short-term memory for visual material. Her interests are, however, more akin to determining the effect of information overload on the visual system. Her experiments are designed to ascertain whether the storage is in the retinal elements or centrally. They consist of presenting various test objects (both moving and stationary) and immediately masking them with subsequent stimuli. These studies are just getting underway and results are not available at this time.

At the University of Sussex an extensive program of visual research is being carried on within the Laboratory of Experimental Psychology and the Center for Research on Perception and Cognition. The two laboratories are run as one unit, sharing workshops, laboratories, etc. There are a total of 10 teaching staff and about 30 postdoctoral research staff in addition to 30 technicians. A wide variety of visual problems is under investigation including photochemistry and photobiology, studies of contrast sensitivity and perception, pattern recognition, and Fourier analysis in the visual system. Over the past few years many visual researchers have been impressed by the analyses of visual processes in Fourier terms and have been asking whether the visual system itself undertakes some form of spatial frequency analysis.

During my recent visit to Sussex, Dr. K. Oatley gave me a reprint of a recent article (*New Scientist*, 12 Aug. 1976) in which some of their work was described. Together with Dr. M.A. Georgeson and G.D. Sullivan, Oatley is carrying out a series of experiments to obtain further information as to whether the visual system acts functionally as a Fourier analyser.

In particular these investigations are designed to analyze visual adaptation to high-contrast sinusoidal gratings. In these experiments the subjects adapted either to a grating of medium or high frequency, or to a single wide or narrow stripe. The subjects' thresholds for sinusoidal gratings of various frequencies, or single stripes of various widths, were then measured. The results "seemed to give strong support to the idea that the visual system contains independent channels selective for spatial frequency." Georgeson and Sullivan are continuing to perform experiments in which subjects view various gratings on an oscilloscope and adjust a control so as to match visually the apparent contrast of a grating at different frequencies to a standard contrast or grating. This technique was demonstrated during the writer's visit.

Dr. G.B. Henning (University of Oxford) is conducting research along similar lines. In a recent paper (*Vision Research* 15, pp. 887-897 1975) some of his research is described. Although work is continuing, early findings indicate that "gratings with three sinusoidal components of high spatial frequency can be shown to interact with a sinusoidal grating two octaves lower in frequency. This finding is inconsistent with the hypothesis that the visual system analyses spatial patterns in independent narrowly tuned bands of spatial frequency." Dr. G.H. Fisher (University of Newcastle upon Tyne) is using a similar technique in studying the development of perceptual maps, and in the analysis of selected visual illusions.

Dr. A. Cowey (University of Oxford) is conducting several visual experiments whose overall objective is the assessment of brain damage particularly within the striate cortex, the superior colliculus and the temporal lobe. His experiments using the Rhesus monkey as a subject, involve the measurement of visual acuity, contrast sensitivity, stereopsis, as well as physiological parameters. He is comparing damage induced by heat, open surgery, severing the optic tract, and lesions by aspiration. Although the work is of a continuing nature, he already has observed that in some cases retinal ganglion cells disappear completely after certain cortical areas are destroyed.

The University of Sheffield has an extensive and well-equipped laboratory for visual research. A number of experiments were underway during the writer's visit. One of the most prolific investigators in the Department is Professor John P. Frisby who, with several colleagues at Sheffield, has conducted an extensive series of experiments relating to the measurement of stereopsis from random-dot stereograms. Such stereograms are "pictures" in which there are hidden objects or patterns whose difficulty to be seen can be varied. Such patterns have been used for years to test for color vision. Their use for studying anomalies in stereopsis is particularly valuable because they provide a very pure test by presenting disparity information in the absence of all other

clues to depth, and thus lend themselves to unfakeable test procedures. Frisby and his colleagues have developed a series of random-dot stereograms which have been used successfully to classify strabismic patients. While other random-dot tests have been used for this same purpose, they have had severe limitations in terms of classification according to Frisby. In December 1975 he published an article (*Developmental Medicine and Child Neurology*, 17, No. 6, pp. 802-806) in which he points out that random-dot tests can be used successfully for different types of squint (strabismus) and for screening for amblyopia and amblyopia-related disorders.

MAN-COMPUTER INTERACTION

A number of studies are underway pertaining to the relationship between man and computer. For example, at the University of Sheffield (MRC Social and Applied Psychology Unit) Professor Max Sime is directing a program designed to develop further a language for computer control of complex psychological experiments. This program is in response to an increase in the use of small digital computers by departments of psychology for the control of experiments. Psychologists at Sheffield are of the opinion that the desirable language for controlling complex experiments should be similar to conventional scientific languages such as FORTRAN ALGOL, but should be equipped with list-processing features and be able to use words as data items when required. Such a language has been developed and is called GLUE (Generalized Language for Universal Experimentation). T.R.G. Green and D.J. Guest (also at Sheffield) describe this system in an article in *Int. J. Man-Machine Studies* 6, 335-359, (1974). Also at Sheffield work is in progress to design computer aids for decision making and problem solving with an emphasis on optimal ways to distribute workloads between man and data-processing equipment. They are also attempting to develop improved techniques for using the computer for medical diagnosis.

A program relating to man-computer interaction also is going on at Loughborough University of Technology in the Department of Human Sciences. This program primarily is under the direction of Mr. K.D. Eason and involves the investigation of problems which arise when computers are first introduced to users such as managers, engineers, clerks, or designers. The objective is to improve the capability to predict human behavior in circumstances involving man-computer interaction by studying the influence of such parameters as response time, the availability of graphical facilities, different hardware and software input devices, along with such factors as personality, experience, and training. For example, the purpose of one such study was to improve system performance and human satisfaction by specifying displays to match more precisely the capabilities and limitations of human controllers. The results showed that the use of probabilistic predictive computer displays gave significant improvement in system performance in a stochastic multistage

decision system. The flexibility of the Department's PDP-12A computer is being steadily increased by adding peripheral equipment in order to support this research further.

In a similar vein, studies are underway to determine the reasons why users, such as managers, when offered a range of facilities by a system, make use of only a small number of those available. In an effort to improve this situation a program, supported by a computer manufacturer, is being conducted for the purpose of redesigning computer-related equipment in order to facilitate its use. Other related studies include one being conducted jointly with the Tavistock Institute of Human Relations (London) to investigate the role of the on-line computer in branch-banking, and a cooperative program with Denmark, Austria and West Germany in which the uses of computers in different countries are being compared.

These are but examples of work in this area. In almost every laboratory visited the writer found extensive use of the computer both in planning and carrying out experiments. In many instances the psychology departments not only had their own computer but also had terminals connected to larger computer facilities located on the campus or in other cities.

OTHER AREAS OF PSYCHOLOGY

The foregoing sections represent only a sampling of the work going on in a small fraction of the universities in the UK. A few additional comments are in order, however, relating to other facilities and research. Many of the universities visited had absolutely outstanding facilities for research and teaching. I was impressed with the animal colonies and sophisticated equipment involved in the programs of comparative psychology. These facilities, even at a single campus, housed animals ranging from small fish to primates. When such facilities are coupled with up-to-date computational equipment, the capability represented is indeed impressive.

The field of speech and hearing is receiving a lot of attention throughout the UK. Many of the places visited had extensive laboratory space allocated to sound booths, anechoic chambers, computers, and specialized equipment for research on basic bioacoustical problems as well as clinical disorders. An excellent facility exists at the University of Sussex where several programs in the perception of speech are underway. In one effort, Professor H.C. Longuet-Higgins is studying the role of intonation contours in understanding speech. He also is involved with a program in theoretical psycholinguistics with particular interest in the role of semantic context in sentence understanding. Dr. C.J. Darwin, also at Sussex University, is carrying out investigations on synthesized speech and on short-term auditory memory. Some of this work is described in an article in the new *Handbook of Perception*, Vol. VII (Language and Speech), Academic Press, Inc., (1976).

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A long standing program on speech perception and psycholinguistics is continuing at the Applied Psychology Unit at Cambridge. A wide variety of work is underway here, and interested parties should contact the laboratory director, Dr. Alan Baddeley. He is interested and personally is conducting research on visual memory in general, and on the memory for faces in particular. As Baddeley pointed out, research on memory seems to have current widespread interest in the UK. Whereas many workers are studying short-term memory, Baddeley is more interested in long-term memory and in the development of mnemonic aids.

SUMMARY AND GENERAL COMMENTS

The writer was continually impressed with the quality of the investigators in the institutions visited and with the depth of knowledge demonstrated in each of their fields. Those with whom I spoke obviously were well trained and seemed to be widely read and well informed about work being conducted elsewhere. This was especially true with respect to work going on in the US where many had spent time either in training or in post doctoral arrangements of one kind or another. For this reason, little liaison was needed with regard to putting them in touch with their counterparts in the US. As is the case everywhere, I frequently found I was calling to their attention work going on at other institutions in the UK or in some instances within their own university.

Compared to research in the behavioral sciences in other countries, the programs in the UK are perhaps of a more basic nature. Although exceptions can be cited (and were), applied research in psychology within the UK university environment takes a back seat to basic research. I found this to be true based on personal observations, attendance at meetings, and from talking with investigators during site visits. In addition to the fact that basic research historically has been associated with academic institutions, the lack of emphasis on applied research is perpetuated by funding practices. Proposals for basic research usually are submitted to one of the Research Councils, and support, if agreed upon, is usually forthcoming within about three to four months. Proposals for research of an applied nature first go to one of the Research Councils and are sent then to the appropriate government agency for further review and approval. The university usually places a higher overhead charge on applied research, and there may be certain restrictions on the publication of results. This means that an investigator may be discouraged from conducting applied research because his career and promotion potential is judged heavily on his publication record as frequently is the case in the US and elsewhere. For all of these reasons, it is much more productive, from the standpoint of the investigator, to apply for and to carry out basic research programs. To oversimplify it is just too much trouble to obtain support for and to conduct applied research in many instances.

The end result of all the above, in the opinion of the writer,

is that such procedures seriously stifle applied research as well as the follow-through with respect to applying the benefits of basic research programs. With the current economic situation in the UK, it seems to me that an environment in which the application of research results and the implementation of technology is discouraged in the academic world is indeed regrettable. It was often with mixed blessings that I saw brilliant well-informed, investigators working in well-equipped laboratories spending their time on what, to me at least (and to them also in some cases), were problems of little, if any, significance and no foreseeable application. While basic research obviously is essential for the advancement of technology, it is a luxury which must be balanced with implementation, especially in a nation where the economic status in general and productivity in particular is in difficulty.

An area in which social scientists could contribute for example, is that of labor-management relations. This clearly is one source of continuing difficulty in the UK and one in which I found no work going on. The only mention I heard of efforts in this regard was at a meeting at the London Business School (in December 1975) in which a large number of psychologists and operations research specialists were lamenting the fact that there seemed to be a lack of planning and long-term policy-making in the UK. Another area in which I found little effort underway is that of public opinion surveys or in the development of survey techniques. The results of surveys as reported in British newspapers do not appear to reflect the use of techniques which have been employed broadly for years in the US. Clearly there is room for psychologists and other social scientists to make major contributions to these and other areas involving some of the problems currently facing Great Britain. The above comments must be qualified, as mentioned in the beginning of this report, because of the limited number of institutions visited. My opinions are based, however, on discussions with many persons other than those contacted during official site visits.

In summary then, based on my limited exposure to psychology in the UK, I feel that the problem, if indeed there can be said to be one, is not the absence of good training, imagination, or basic talent, but rather one of research priorities. While psychologists are not particularly well known for solving problems of society, perhaps if the outstanding talent existing in the behavioral sciences in the UK could address, more than it now does the major technical and social issues facing the country, those involved could significantly contribute to the recovery of a great nation.