

nial celebration of the American Museum of Natural History, she was awarded its gold medal for distinguished achievement in science. This was her last official visit to the museum.

With the publication of volume VI of *The Invertebrates*, Dr Hyman's monumental contribution was completed. No one person can carry on her project, but the publishers intend to continue the series with each major group handled by a different author. The preface of her last volume concludes with the words "I now retire from the field, satisfied that I have accomplished my original purpose—to stimulate the study of invertebrates".

Correspondence

Identification of Concealed Randomized Objects

SIR,—Our first comments¹ on earlier responses to our communication² seemed to us adequate, and ordinarily we would have left the matter there. Since then, however, Robertson and Fienberg³ and Hansel^{4,5} have made other points on which we would now like to comment.

In the first place, limitations of space prevented us from including in our communication all the details of the experiments, so that Hansel is correct in stating that our communication did not present all the data that were used in calculating the overall probability $P < 10^{-50}$. Contrary to the assumption of Robertson and Fienberg, our communication dealt not with a single experiment but reviewed a series of experiments in which the same materials and basic procedure were used. That we chose to review all results obtained under these conditions did not involve "optional stopping", since we did not exclude any experiment with similar conditions.

The results clearly did not depend on the reductions made in the number of target objects, since our table shows that significant results were obtained in the series with sets of ten, eight and four covers. Nor was there any general improvement in the discrimination of cover 15/16 as the size of the sets was reduced.

The proposal that Stepanek's discrimination depended on olfactory stimuli emanating from one cover cannot explain the fact, as stated in our communication, that the subject was sometimes able to discriminate between the two sides of the same object. It is also excluded in those earlier (and numerous) experiments in which Stepanek discriminated the white from the green side of the cards, which has also been explicitly shown not to depend on warping⁶. Or is it seriously proposed that one side only of the objects or cards carried the odour and that this was discriminated?

In general, Stepanek has not achieved significantly high scores when he is completely separated from the target materials. (He was, however, successful in a recent experiment in Charlottesville in which he saw, but did not touch, the outside containers.) He does not refuse to experiment under these conditions, but we have gained the impression that, like many other sensitives, he has come to favour a particular set of conditions for working. This is equally true for many other kinds of behaviour not belonging in parapsychology, and we believe that Stepanek's lower scores in other conditions similarly result from psychological inhibitions setting in when his habitual style of working is changed. We are in the process of testing this hypothesis further while continuing efforts to train him to respond successfully to target materials when completely isolated from them.

Robertson and Fienberg object to the fact that the covers were exposed to the subject's vision in the first three series we reported in our communication. We made it quite explicit that the ESP targets during that stage were concealed cards and that we did not regard the

responses to the exposed covers in these series as evidence of extrasensory perception. Our main point, as clearly stated, was that the subject had apparently learned to discriminate the covers in sensory conditions and had then continued this discrimination by extrasensory perception when these objects were effectively concealed from his vision or any other ordinary sensory pathway.

Our communication cited the data for one outstanding test object (cover 15/16) as an illustration only. We have elsewhere, however, regularly analysed the results for all the targets within each series, and we have recently correlated responses to identical targets between series in conditions both of sensory exposure and of concealment. This analysis shows a high correlation between the subject's tendencies to call the same targets "white" when visible to him and when concealed.

Robertson and Fienberg propose a different method of statistical analysis, and we make no objection. We only wish to point out that the process of randomization used made the targets of different runs independent of each other, and the possibility of inference based on feedback from preceding runs was excluded. Of course, the calls within a particular run were not independent of each other, but this fact was statistically conservative in its effect.

In summary, we think many of the objections raised against this research have already been met in longer publications^{7,8} or even by a careful reading of our brief communication. The work with Stepanek has not thus far provided an experimental demonstration of extrasensory perception that is invariably repeatable. He has his "off days", and the conditions in which his capacity manifests seem to have rather narrow limits. Nevertheless, considering the large number of independent investigators with whom Stepanek has demonstrated highly significant performance under rigorous and varying conditions⁹, he has come closer than any previous subject to providing a predictable demonstration of extrasensory perception under experimental conditions of control. Contrary to Hansel's statement, Stepanek has succeeded after the publication of numerous reports on his successful ESP performance.

Yours faithfully,

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J. G. PRATT

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¹ Pratt, J. G., and Stevenson, I., *Nature*, **221**, 586 (1969).

² Pratt, J. G., Stevenson, I., Roll, W. G., Blom, J. G., Melmsna, G. L., Keil, H. H. J., and Jacobson, N., *Nature*, **220**, 89 (1968).

³ Robertson, A., and Fienberg, S., *Nature*, **221**, 687 (1969).

⁴ Hansel, C. E. M., correspondence *Brit. J. Psychiat.*, **115**, 743 (1969).

⁵ Hansel, C. E. M., *Nature*, **221**, 1171 (1969).

⁶ Blom, J. G., and Pratt, J. G., *J. Amer. Soc. Psychological Res.*, **62**, 28 (1968).

⁷ Keil, H. H. J., and Pratt, J. G., *J. Amer. Soc. Psychological Res.*, **63**, 253 (1969).

⁸ Pratt, J. G., and Keil, H. H. J., *J. Amer. Soc. Psychological Res.*, **63**, 314 (1969).

⁹ Pratt, J. G., Keil, H. H. J., and Stevenson, I., *J. Amer. Soc. Psychological Res.* (in the press).

Proposed New Unit of Frequency

SIR,—I propose the establishment of a new intermediate unit of frequency—pitts. The pitts equals "pulses per second", "nerve pulses per second" or "spikes per second", all relatively clumsy terms used indeterminately by neurophysiologists, brain research workers and others.

The proposed new unit honours the late Walter Pitts, colleague of the late Warren McCulloch. Pitts and McCulloch, then at the University of Illinois Medical Center in Chicago, published a brilliant series of papers in the *Bulletin of Mathematical Biophysics* during the forties¹⁻³ which laid the foundation for the treatment of central nervous system physiology as information processing within networks of "formal neurones", now called

McCulloch-Pitts neurones. Their work was highly original; we must go back to Descartes with his postulation of the reflex and reciprocal innervation for previous concepts of similar grandeur. An interesting consequence of their work, not widely known, is that John von Neumann, after personally discussing with McCulloch at the train station at Princeton(!) the logical calculus that is possible by utilizing the McCulloch-Pitts neurones, chose this method to state the logical design functions of the EDVAC computer. Thus these advanced scientific concepts of brain function early influenced the engineering development of the digital computer; an example of "bionics" or, to use the term McCulloch preferred, "biomimetics".

The "pitts", if adopted widely by neurophysiologists, will simplify the descriptive prose and lettering of our present day papers and their graphical figures.

Yours faithfully,

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of Engineering Science,
University of California, Berkeley.

¹ McCulloch, Warren S., and Pitts, Walter H., *Bull. Math. Biophys.*, **5**, 115 (University of Chicago Press, Chicago, 1943).

² Pitts, Walter, and McCulloch, Warren S., *Bull. Math. Biophys.*, **9**, 127 (University of Chicago Press, Chicago, 1947).

³ McCulloch, Warren S., *Embodiments of Mind* (The M.I.T. Press, Cambridge, Massachusetts, 1965).

Sabbatical Itinerants

In the hope of providing some practical assistance in the good cause of mobility between laboratories, *Nature* advertises the needs for housing of families about to take up periods of sabbatical leave. To begin with, no charge will be made for advertisements like this. It is hoped that a period of experiment will show what form these advertisements could most usefully take and whether they are effective.

Vacant: Five bedrooomed house in London, February through June. Please contact John Maddox, *Nature*, 4 Little Essex Street, London WC2 (01-836 6633).

Vacant: Extremely well furnished house with central heating and fitted carpets to let, March to September. Two double bedrooms, kitchen, breakfast room, bathroom, double reception room. Overlooking St Paul's School playing fields and river, near Hammersmith Bridge. Easy access to central London. Domestic help available. Please contact Mrs R. C. Schroter, 47 Lillian Road, Barnes, London SW13.

Wanted: Furnished house for Australian academic, wife and three children, from February to end of April 1970. Within reasonable distance of the University of Manchester. Please contact Dr C. G. Sinclair, Department of Chemical Engineering, UMIST, Manchester M60 1QD. Telephone: 061-236 3311, Ext. 532 or 2127.

Wanted: Furnished house or flat in London area from late August 1970 to July 1971, for a biologist, his wife, and 15 year old son and daughter; three bedrooms with central heating and convenient transport to University of London King's College. Please contact Professor Carl Moos, Biochemistry Department, State University of New York, Stony Brook, NY 11790, USA.

British Diary

Monday, January 26

Injection Moulding—Latest Developments (7.30 p.m.) Mr M. A. Wheelans, Institution of the Rubber Industry, at the Stork Hotel, Queen Square, Liverpool.

Ion Implantation (10.30 a.m. colloquium) Institution of Electrical Engineers, at Savoy Place, London WC2.

Satellite Television Distribution—Service for Geo-Stationary Satellites to Community Antennas in Multiple Coverage Areas (5.30 p.m.) Mr A. J. Jeffris, Mr D. G. Pope and Mr P. C. Gilbert, Institution of Electrical Engineers, at Savoy Place, London WC2.

Tuesday, January 27

A Management Predictive Reporting System (5.30 p.m.) Mr R. A. Peddie, Institution of Electrical Engineers; and the Automatic Control Group of the I.Mech.E. at Savoy Place, London WC2.

Breathing and Breathlessness in Lung Diseases (5.30 p.m.) Dr J. G. Widdicombe, University of London, at the Institute of Child Health, 30 Guilford Street, London WC1. (Sixth of fifteen lectures on "The Scientific Basis of Medicine".)

Cation Radicals in Polymer Chemistry (6 p.m.) Dr A. Ledwith, Society of Chemical Industry, at 14 Belgrave Square, London SW1.

Can We Afford to Make It—Cost Estimating and Management Decisions (discussion) Institution of Mechanical Engineers, at 1 Birdcage Walk, London SW1.

Computers—Planning for People (6.15 p.m.) Mr M. Rigby, British Computer Society, at the Library Theatre, Bradford.

Excavations at Neolithic Photoliths in Thrace (5.54 p.m.) Dr Colin Renfrew, University of London, at the Institute of Archaeology, 31-34 Gordon Square, London WC1.

Heat (5.30 p.m.) Professor R. King, Royal Institution, at 21 Albemarle Street, London W1. (Lecture for Sixth Form Pupils from Schools in London and the Home Counties. To be repeated on January 28, February 3 and 4.)

Structural Changes in Muscle and Muscle Proteins during Contraction (5.30 p.m.) Dr Hugh E. Huxley, FRS, University of London, in the Old Chemistry Lecture Theatre, University College London, Gower Street, London WC1.

Systems Integration (5.30 p.m. discussion) Institution of Electrical Engineers, at Savoy Place, London WC2.

Whatever Happened to the Bomb? (7.30 p.m.) Professor Eric Burhop, Dr David Butt and Dr Frank Barnaby, British Society for Social Responsibility in Science, at The Black Horse, Rathbone Place, London W1.

Wednesday, January 28

Changing Face of the Thermosetting Industry (5 p.m. symposium), Plastics Institute, at the Great Western Hotel, Paddington, London W2.

Isotopic Ages of Rocks and Minerals from the British Isles, Dr Janet V. Watson and Dr A. P. Sabine; **The Burrows and Traces of Recent Littoral Crustaceans Revealed by Epoxy Resin Casting on the Atoll of Aldabra, Indian Ocean**, Dr G. E. Farrow; **The Foyers Granitic Complex, Inverness-shire, Scotland**, Dr R. J. Marston (5 p.m.) Geological Society at Burlington House, Piccadilly, London W1.

Machine Shop Simulation (7.30 p.m.) Mr C. Montagnon, British Computer Society, at Courtaulds Ltd., Lockhurst Lane, Coventry.

Recent Theories of Creep in Metals (6.45 p.m.) Mr D. McLean, Manchester Metallurgical Society, at the Manchester Literary and Philosophical Society, George Street, Manchester 1.

Science and Crime Detection (2.30 p.m.) Professor Francis E. Camps, Royal Society of Arts, at John Adam Street, Adelphi, London WC2.

The Charting of Scientific Progress by Literature Networks (1 p.m.) Mr A. E. Cawkell, Royal Institution History of Science Discussion Group, at 21 Albemarle Street, London W1.

The Classification of Immunity Deficiency Diseases (2 p.m.) Professor J. F. Soothill, University of London, at the Royal Postgraduate Medical School, DuCane Road, London W12.

The Re-direction of Aggression in Primates (5.30 p.m.) Dr R. P. Michael, University of London, at the Institute of Psychiatry, De Crespigny Park, Denmark Hill, London SE5.

Water-cooled Generator Connections (5.30 p.m.) Mr L. Abram, Mr J. Goodall and Mr T. G. Wentworth, Institution of Electrical Engineers, at Savoy Place, London WC2.

Thursday, January 29

Advances in Design and Operation of Process Furnaces and Fired Heaters (9.30 a.m. symposium) Institution of Chemical Engineers; and the Institute of Fuel, at the Royal Aeronautical Society, Hamilton Place, London W1.

Hardware and Software Aspects of Store Organization in a Multi-access Environment (5.30 p.m. discussion) Institution of Electrical Engineers Joint IEE/IERE Computer Group, at Savoy Place, London WC2.

Information on the Metabolism of Different Cell Types in the Nervous System from Studies of the Effects of Organometals (5 p.m.) Mr J. E. Cremer, University of London, at the Middlesex Hospital Medical School, Mortimer Street, London W1.

Oil and Oceanography (5.30 p.m.) Dr T. F. Gaskell, Institute of Petroleum, at 26 Portland Place, London W1.

Strong Fibrous Solids (10 a.m. discussion) Royal Society, at 6 Carlton House Terrace, London SW1.

The Future of Essential Oils (7.30 p.m.) British Society of Perfumers, at the Royal Society of Arts, John Adam Street, Adelphi, London WC2.

The Induction-excited Alternator (5.30 p.m.) Professor F. C. Williams, Dr G. W. McLean and Dr D. Tipping, Institution of Electrical Engineers, at Savoy Place, London WC2.

The Physiology of Intravenous Urography (5.30 p.m.) Dr T. Sherwood, University of London, at the Institute of Child Health, 30 Guilford Street, London WC1. (Seventh of fifteen lectures on "The Scientific Basis of Medicine".)