

# mbe news

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March 1976

## Dr. Llewellyn Thomas is keynote speaker for 11th ICMBE

About 7,000 copies of the last two announcements of the 11th international conference on medical and biological engineering, to be held in Ottawa during August 1976, have been distributed and a fourth has been prepared. It will be in English and French. Air Canada and Canadian Pacific Airlines are the official carriers for the conference. The official tour agents are Capital Tours of 56 Sparks Street, Suite 315, Ottawa, Canada K1P5A9. Their UK agents are Medical Conference Travel Services of Brighton, England. These companies can handle enquiries regarding conference tours as well as transportation to and from Ottawa.

Dr. E. Llewellyn Thomas has been named as the keynote speaker for the conference. He has had a distinguished career in both disciplines as he has been associate director of the Institute of Medical Engineering of the University of Toronto and is now associate dean of medicine.

Prof. R. L. Clarke and J. A. Hopps have been named as a committee of two to study a possible union between the International Organisation for Medical Physics and the International Federation for Medical and Biological Engineering. Prof. Clarke has also visited Jerusalem to consider the possibility of a further combined IFMBE/IOMP conference there in 1979.

The Canadian Medical and Biological Engineering Society has established a system of special membership classes to be used in recognition of merit and special services. These are: Fellowship—for members who have rendered outstanding service to biomedical engineering; Honorary Membership—to be conferred upon non-members who have performed

special services for the Society; Emeritus Membership: for members over 65 who have contributed to biomedical engineering. The first recipients of these special grades will be announced at the 11th ICMBE. The 6th Canadian conference on medical and biological engineering will take place in Ottawa at the same time.

## NEW PRESIDENT FOR BES

Prof. John Mallard, head of the Medical Physics Department of Aberdeen University, was elected to succeed Prof. David Simpson as President of the UK Biological Engineering Society on the conclusion of David's term of office. John Mallard has established an international reputation for his work on radioisotope imaging techniques and is a former President of the UK Hospital Physicists' Association. It is to be hoped that he will further current moves aimed at bringing the BES and the HPA even closer together. Apart from his many years of service to medical physics and biological engineering, David Simpson will long be remembered for his master-minding of the BES's Edinburgh conference during August 1975. He was originally set to train as a chartered accountant, but wartime circumstances deflected him to medical physics. Accountancy's loss was indeed our gain! Newly elected BES council members are Leonard Cotton (vascular surgeon and a member of the Council of the Royal College of Surgeons of England), Roy Hughes (pharmacologist) and Eric Leask of the Scottish Home and Health Department.

## Survey of biomedical engineers

A 23-page survey on US professional society activities and certification of clinical engineers and biomedical engineering technicians is available without charge from Quest Publishing Company, Box 4141, Diamond Bar, Calif. 91765. It indicated that 'certification' is highly favoured by those engineers and technicians working in hospitals. Those working in industry, however, were split on this issue. The largest numbers involved in the survey belonged to AAMI, the IEEE's group on engineering and biology, and the American Society of Hospital Engineering. Of the technicians, 62% did not belong to any national organisation. The report includes a rating of the professional activities of the leading US national biomedical societies. The American Society for Testing & Materials (ASTM) obtained the highest rating for its biomedical standards activities. 61% of replies favoured joining a new society for biomedical engineers and technicians. This, together with the low proportion of technicians in existing organisations, must be the 'writing on the wall' for someone to read. Is there a need for the IFMBE to take on an international co-ordinating role in this important area?

## CONSIDER THE PATIENT

The crucial link between the person providing health care and the person receiving it is often very weak indeed. Modern medicine tends to emphasise technical solutions and to overlook the value of close personal contact and relationships (*World Health*, December 1975).

# Bioengineering in Britain

*Bio-engineering in Britain* is the title of a 64-page booklet edited by A. R. J. Wise and published in 1975 by Health and Social Service Security Journal/Hospital International of 27-29 Furnival Street, London EC4A 1JR, price £2. The final paragraph of the Introduction by Dr. David Owen, Minister of State (Health), reads 'I do not think the importance of biomedical engineering can be overstressed, but if the maximum benefits are to be realised, there will be need for increasingly close co-operation between the various professions involved in the hospitals and those in university departments of engineering and in British industry'.

The booklet contains a series of short articles on various aspects of biomedical engineering: 'Guidelines of orthopaedic endoprosthetic surgery', by Prof. J. T. Scales; 'A revolution in X-ray diagnosis', by W. E. Ingham; 'Orthotics—today and tomorrow', by Dr. R. G. S. Platts; 'Clinical measurement in the hospital service', by Dr. J. P. Blackburn; 'measurement of blood-oxygen tension by polarography', by Dr. A. P. Adams; 'A new philosophy in lung ventilator design', by L. A. Cox; 'Recent advance in the investigation of lung function in infants and children', by Dr. S. Godfrey; 'Modern aids for the blind and visually handicapped', by R. Dufton; 'Continuous wear soft lenses as an adjunct to cataract surgery', by Dr. H. J. Kersley; 'Monitoring and the patient-sensor interface', by Prof. J. P. Payne; 'Mass spectrometers in medicine—dream or reality', by Dr. J. A. Bushman; 'Ambulatory monitoring', by H. S. Wolff; 'A new limb for knee disarticulation', by Dr. R. W. May; 'Bioengineering as a clinical discipline', by Prof. J. M. A. Lenihan; 'History and practice of dialysis', by J. W. Longbottom and J. Pearce, and 'Pacing the heart in 1975', by J. Norman.

The booklet is well produced on good-quality paper with ample illustrations and most of the articles include key references. The subjects are topical and it is interesting to speculate on the role of a publication which sets out to show what biomedical engineers are now offering the medical community and, most importantly, the patients. There should be a role for this type of booklet in

reminding international organisations such as WHO of the need to watch closely engineering developments as they relate to hospital practice. It must also have a part to play in committees allocating resources to hospital engineering/physics departments and maintenance organisations. The activities in Britain can be paralleled in many other countries and hospital administrators will be encouraged to see the help that is now available from trained biomedical engineers. University departments of engineering will also find the booklet of value to show their undergraduate and post-graduate students something of the possibilities for research and development which exist in our field.

## Mathematical modelling

The City University workshop on the mathematical modelling of biological systems will be held by the Department of Systems Science at the City University, London, from April 5th to 7th 1976 and is intended principally for biologists and doctors engaged in the analysis of biological systems and having some knowledge of mathematics. Case studies will include metabolic and endocrine systems and cardiovascular, respiratory and renal systems. Supplementary lecture and tutorial sessions will be provided, together with technical demonstrations. Residential accommodation is available. Details from E. Carson, Department of Systems Science, The City University, St. John Street, London EC1V 4PB, England.

## Brain bibliography

The Brain Information Service has announced the publication of the Bibliography of Electrical Recording in the CNS and Related Literature 1973. It includes both authors and key word in context (k.w.i.c.) indexes. This and previous annual volumes are available at \$6 in the USA and \$9 overseas from the BRI Publications Office, Centre for the Health Sciences, University of California, Los Angeles, Calif. 90024, USA.

# THE WOMAN IN BIOMEDICAL ENGINEERING

If biomedical engineering as an academic discipline runs true to form, it will, in the West at least, be a mainly male preserve. To help try and redress this imbalance, in future issues, this column will be run by Pamela J. Rogers, a nurse, midwife, planner and designer. She will try to find out where the women in biomedical engineering are (or where they are not) and what they do (or should do).

## Activities

News of women's activities in biomedical engineering, including notes on research studies, meetings, career problems and opportunities, collaboration with other disciplines (e.g. nursing, social work and industry) and problems in caring for the handicapped at home, which might be assisted by the improved application of low technology, will be welcomed and should be sent to Miss Rogers at 30 Stevenage Road, London SW6 6ET.

## The right to live

The January 1976 issue of the World Health Organisation's journal is devoted to the thought-provoking theme 'health and human rights'. In an article on 'The right to live', Jean Jonchères points out that in order to free itself from a burden, does society have a right to say which lives are not worth living or to judge the utility of an individual's existence? Maurice Papworth discusses how far it is justifiable to carry out medical experiments on a human being. Samuel Halter discusses the effect of health of environmental pollution and makes the point that 'it is the quality of life that ought today to be at the centre of the preoccupations of the public health authorities'. Jean de Moerloose reminds us that 'the right to health protection carries certain obligations with it, and may require us at times to concede a modicum of our precious freedom'. This is an issue which all thinking biomedical engineers would do well to read.

## TOILET DESIGN

Toilet arrangements—design of fixtures and fittings, this was the subject of an informal meeting held at the Institute of Mechanical Engineers, London, on 30th October 1975. The chairman, Prof. John Scales, introduced the speaker, Eileen Rogers, head occupational therapist at the Mary Marlborough Lodge, Nuffield Orthopaedic Centre, Oxford.

For the severely disabled person, using the toilet was frequently the most difficult everyday activity to achieve. The main problems were defined as: difficulty in access; problems of transfer on and off the toilet; problems of cleansing and arranging clothes. The achievement of privacy and independence, were the Centre's chief aims, and a good design of toilet accommodation was vital. Slides were shown of ergonomic studies performed in Oxford.

Those attending included engineers, doctors, nurses, designers and officers of the Scottish Home and Health Department, Department of Health and Social Security, health regions and local authorities. The London Borough of Hillingdon was designing improved access to public conveniences for disabled persons. The Department of Design Research at the Royal College of Art, London, had done work on a commode and w.c. seat design; and on individual toilet areas at home for spastic children. The necessity for matching the height of a patient's newly prescribed wheelchair to his w.c. and handbasin facilities at home was raised during the discussion.

Enquiries concerning the session to Eileen Rogers.

## IMPLANTABLE HEARING AID

Dr. Richard Goode of Stanford University Medical Centre, Palo Alto, California, is working on the development of a hearing aid for implantation within the head. A small magnet would be placed on the ear drum or inner ear bones and the magnet would vibrate in synchronism with the field from a coil energised from a microphone and amplifier. The device would require an implanted rechargeable battery. It is hoped that a practical device will be ready by 1980.

## New defibrillator model

An initial model of an a.c. defibrillator with a digital timer has been produced and successfully tested in several animals. It has proved possible to defibrillate with discharges as short as one cycle of the 50 Hz mains (20 ms). An account of the instrument will be published in the Barcelona, Spain, journal *Mundo Electrónico*, under the title 'Defibrilador cardiaco por descarga de corriente alterna con control digital de tiempos', by R. A. Fernandez, S. Guillen and M. E. Valentinuzzi. Dr. Max Valentinuzzi has been invited to attend the Universidad Autónoma Metropolitana, Unidad Iztapalapa, Mexico, from January to April 1976 to give an introductory course on bioengineering.

Dr. Valentinuzzi and his colleagues are interested in maintaining correspondence with other laboratories or bioengineering centres. Please contact them at Laboratorio de Bioingeniería, Instituto de Ingeniería Eléctrica cc. 47, suc. 2, 400 San Miguel de Tucumán, Tucumán, Argentina.

## Biomedicine in Sri Lanka

H. G. S. Ranasingne, the first and only IFMBE member in Sri Lanka (formerly Ceylon), tells us that the Division of Electromedical Engineering in Sri Lanka now has a staff of more than 100 with about 10 qualified and trained engineers. A wide range of maintenance work is undertaken, including X-ray image intensifiers, cardiac monitoring systems, electroencephalographs, electromyographs, physical medicine apparatus and anaesthesia equipment. In Sri Lanka, the Health Service is state controlled with almost free medical aid for every citizen. Mr. Ranasingne has 26 years' experience in this field with a developing country and would like to make his services available to other developing countries. He can be contacted at 55 Vijaya Road, Grampaha W. P., Sri Lanka. It is interesting to recall that this activity in Sri Lanka was originally started by former IFMBE President Jack Hopps, who was a Colombo-plan consultant engineer for Ceylon in 1957.

## Car adaptation for disabled

The London *Sunday Times* carried an interesting report on the adaptation of a Daf car by engineers of the Dutch Rehabilitation Institute, near Amsterdam, under William Zevering. The car is used by 26-year-old Marjo Gerritsen, who is paralysed from the chest down and the wasting muscles and joints of her hands can exert only the smallest force—less than it takes to press down a normal typewriter key. At the touch of a button, the whole driving seat will swing out alongside her wheelchair and it can be lowered to the height of the chair so that she can shuffle into the seat. The seat then lifts and swivels to place her in the car so that she can fasten her safety straps and fit her head into a padded guard. Because Marjo cannot grip, the car's power steering is operated via a cuff fixed to the steering wheel into which she puts her arm. The servo-assisted brakes are operated by a swivelling column on an arm rest. The degree of braking is controlled by the position of the column instead of pressure applied to it. A tap to the left produces an emergency stop. The accelerator is a

padded lever on the right squeezed inwards by Marjo's right elbow as she leans on the arm rest. Controls such as those for the windscreen wipers, washers, horn, lights and windows are worked by microswitches on the brake column.

Marjo worked with the engineers for a year to find methods of compensating for the physical deficiencies arising from her rheumatoid arthritis. The engineering team have never sent anyone away and claim that there are always ways of adapting a car. The cost of the changes was £6000 on top of the car's price of £1000, but in other cases adaptations have cost as little as £150. In Holland these adaptations are provided free. The car is also provided free to anyone earning less than £6000 per year. For those invalids who are, or who have been, working, the money comes from a disability fund which employers and employees both contribute. Disabled people who have never worked have the car paid for by local authority social services if they need it to participate in community life.

# Symposium on external control of human extremities

An international round table on the present position of functional electrical stimulation was held at the 5th international symposium on the external control of human extremities at Dubrovnik in August 1975. The discussion was concerned with both the technical/medical and the social economic/psychological aspects. As an opening, Dr. Vodovnik queried why it was that after 15 years of research, f.e.s. has only been slowly accepted by clinicians and patients and what might be done to speed progress. Some clinicians still see a need for double-blind trials to prove the superiority of f.e.s. over mechanical braces, and many doctors and patients feel diffident towards electrical devices. Reliability is still a problem, and the probability that a particular commercial peroneal stimulator will work for 1000 hours is under 20%. The cost/benefit ratio of the current devices needs improvement. The problem is aggravated with multichannel or programmable devices which have an increased price and complexity.

As Dr. Gracanin mentioned, the application of f.e.s. braces has so far been limited mainly to hemiplegic patients, but the technique is also applicable to scoliosis correction, care of peripheral nerve lesions and the improvement of the gait of cerebroparalytic children. In addition to the control of mobility and posture, f.e.s. holds promise of the use of intravaginal or intrarectal stimula-

tors for the control of incontinence and also for the relief of chronic pain. A team approach to the problem of f.e.s. is required, including clinicians, engineers and physiotherapists. Efforts should be made to identify all types of patients who might benefit from f.e.s. and an evaluation should be made of the economics of domiciliary and hospital treatment. In addition to investigations of the neurophysiological mechanisms involved, quantitative investigations of the therapy will be

required. Maximum publicity needs to be given to the possibilities of f.e.s. and engineering effort devoted to the production of commercially available rugged, reliable and easy to maintain devices. It is hoped that the next Dubrovnik meeting will feature a larger number of papers on f.e.s. with clinicians and engineers as co-authors and reporting clinical results, acceptance and new devices. Further information from Ing. R. Merletti, SORIN, Societa Ricerche Biomediche, 13040 Saluggia, Vercelli, Italy.

## NASA techniques help elderly

Food technology and packaging techniques, developed by the NASA Johnson Space Centre at Houston to feed Apollo and Skylab crews during space flight, are being applied in a pilot programme to help provide balanced meals to elderly people who live alone. Project engineer Gay Primeaux has reported that surveys indicate that many elderly Americans do not receive adequate nutrition, owing to factors such as a lack of single-serving products, limited mobility, loss of skills needed to prepare balanced meals, limited finances and often a sense of loneliness or rejection which reduces the incentive to cook and eat nutritious meals alone. While several programmes for home delivered hot lunches for the elderly

are being tried in some cities, there is usually no weekend service and spoilage risk is high. Hence the NASA team is aiming for a shelf-stable multimeal package which can be distributed by several methods—even parcel post. The basic meal will consist of an entree, 2 side dishes, dessert and beverage, with a 21-day menu cycle to provide variety from a list of 10 entrees, 20 side dishes, 10 desserts and 5 beverages. Each meal will provide at least one third of the daily dietary allowance for elderly persons. The programme is expected to cost \$240 000, of which NASA will find 125 000. Further details from Terry White, Press Office, Lyndon B. Johnson Space Centre, Houston, Texas 77058, USA.

## MEDICAL & BIOLOGICAL ENGINEERING

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### ORDERS, WITH REMITTANCES, TO

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# book reviews

**Anaesthetic equipment: physical principles and maintenance** by C. S. Ward. *Baillière Tindall*, London, 1975. 282 pp., £8.50

At first glance, this highly illustrated book would seem to satisfy the commonly expressed need for a practical manual on the care and maintenance of anaesthetic equipment which was both lucid and comprehensive. Unfortunately, further inspection reveals substantial gaps in the information which are not readily explained on rational grounds, and the situation is not improved by numerous statements which are badly phrased, often misleading and sometimes frankly in error.

Two quotations, perhaps, will illustrate these points. First, on p.95, under the heading of circle absorbers, it is stated:

Although there is little dead space, the capacity of the tubes alone is over a litre, and of the whole apparatus considerably more. At the beginning of an administration there should be a high fresh gas flow to purge the circuit of air and nitrogen evolved from the patient's plasma.

Again, on p. 171, the term 'parameter' is defined as follows:

It may be taken to be a factor common to a number of equations or situations and which may be taken as an arbitrary constant which defines or assists in defining the relationship between other variables, and quantifies them.

Even the material that is presented is often woefully short of hard facts, as witnessed by the section on the electroencephalogram which includes the statement that the typical e.e.g.s are shown in Fig. 244 without further qualification. The thoughtful reader is forced to ask typical of what?

The rather curious format whereby a substantial area of each page has been left blank in the form of a margin is difficult to understand unless it was merely a device to allow the insertion of numerous additional illustrations. Whatever the reason the end result is a scrappy, untidy appearance which adds nothing to the attraction of the book. Many of the figures themselves are excellent, particularly those provided by the manufacturers, but a few insult the

intelligence of any anaesthetist, nurse or technician. Surely it is unnecessary to include in any book a photograph of a brush for cleaning endotracheal tubes (Fig. 246); and it is perhaps typical of the careless proof reading that the caption refers to brushes although only one appears in the illustration. On the subject of errors, Dr. Rowbotham's name has been consistently misspelt, both in the text and in the index, and there are other equally inexcusable spelling errors.

The author has avoided the use of SI units throughout his text and the somewhat inadequate appendix which he has provided to rectify this not only sets out the definitions in the wrong notation but also contains some errors of fact; for example, the var is not an SI unit, although it is allowed in conjunction with SI for the moment.

Undoubtedly Dr. Ward's concept was good, but the lucid comprehensive manual on the care and maintenance of anaesthetic equipment has yet to be written.

J. P. PAYNE

**Structural stability and morphogenesis** by René Thom. *W. A. Benjamin Inc., USA*, 1975. XXV+348 pp. £12.40 hardback, £7.45 paperback

The description of highly complex systems by mathematical models runs into the curse of dimensionality. Models involving too many parameters and variables cannot be handled effectively, even by the most powerful of modern computers. They certainly do not have that power of giving insight, which is perhaps the greatest value of mathematical models. There are many complex systems, the investigation of which calls for the explanatory and predictive power of mathematical models, but for which existing mathematical approaches are inadequate. Such systems abound, of course, in biology, but they present themselves as well in the study of social and political systems. Their study calls for new theoretical languages in which they can be modelled.

Prof. René Thom, an eminent French mathematician, has applied

the powerful concepts of topology to the study of biological systems and especially the problem of succession of form. His book *Stabilité structurelle et morphogénèse* has been greeted as a major intellectual advance. The concept of catastrophe, which he introduces, and his work has received widespread attention.

The present translation of Prof. Thom's book will facilitate access to his work to an even wider readership.

The book is undoubtedly difficult to understand. It calls for a familiarity with topology and a general grounding in abstract mathematic concepts, of a kind few biologists or even engineers and physicists possess. Although the significance of the book is in its applications, it is a mathematician's book. The conceptual framework it offers is bold and sweeping. The general theory of models it outlines presents a powerful challenge to mathematicians and theoretical biologists, calling for development and interpretation.

It will take some time to evaluate the lasting significance of the work. Its impact and the stimulus it provides is undoubted.

L. FINKELSTEIN

**Who's who in computing 1975/76** edited by Roger Graham and Ronald Yearsley. *Leviathan House Ltd.*, 1975. 138 pp., £16.50

Considering that this book is a large-paged but thin paperback the price of £16.50 seems rather extortionate for a rather incomplete listing of some of the people involved with computing. Apart from the high price of this book, it appears to be rather inaccurate and not very comprehensive. The list of abbreviations is very bad. IMA is the Institute of Mathematics and its Applications not the International Music Association and FIMA is a fellow of the above Institution, not a fellow of the Institute of Municipal Associations. There appear to be many important names in computing that are not in this book, for example the current President of the British Computer Society (BCS).

I do not know how the information for this book was compiled, but it

claims to be with the support and co-operation of the British Computer Society; having seen this Who's Who, I doubt if the BCS would want to be associated with it. The book is advertised as having an introduction by Ray Barrington, Immediate past president of the BCS; this greatly advertised introduction is only 10 lines long.

To sum up, this book seems to be very bad value for money, perhaps because it contains no advertising material. If you want to know who runs a certain computer unit, the 1975 edition of the *Computer users year-book* is undoubtedly a better buy because it is cheaper, hardbound, much thicker and has virtually all computing centres listed together with d.p. managers' names, addresses and telephone numbers, it also contains much other useful information.

*Who's who in computing* has one saving grace, in the back are forms for entries into the next edition; one may only hope that everyone in computing will fill in one of these forms, then, in November 1976, we may get a worthwhile and comprehensive second edition of *Who's who in computing*.

I. R. PERRY

**Mechanics today** edited by S. Nemat-Nasser. *Pergamon Press*, vol. 1 1972 and vol. 2 1975

Realistic analyses providing an insight into the mechanics of anatomical structures and physiological phenomena cannot be sustained on simplistic mechanics foundations. The *Mechanics today* series provide a useful compilation of comprehensively and rigorously presented articles on specialised topics of current interest. The readily available treatments of esoteric mechanical topics should prove useful by providing the analytical foundations for determining rigorous solutions of some hitherto untreated biomechanical problems.

Volumes 1 and 2 contain articles on thermodynamics and finite-element approximations of continua, variational methods in elasticity, some nonlinear elasticity solutions obtained from the differential equations of nonlinear elasticity, theory and experiments of plastic-wave propagation, criteria of crack propagation under quasistatic and dynamic loadings, viscometric motions of

viscoelastic fluids, creep laws and methods of analysis of viscoelastic structures, propagation of large-amplitude pulses in bounded and semi-infinite dissipative media. Each chapter presents a generalised theory and treatment of special cases exemplifying the theory.

Some biochemical studies that can be initiated on the basis of the treatments given in vols. 1 and 2 are delineated below.

#### *Elasticity of anatomical materials*

The notes on continuum thermodynamics and nonequilibrium thermodynamics by Gurtin and Nemat-Nassar, respectively, are useful for the development of constitutive equations for passive and active anatomical tissues. In as much as anatomical organs are particularly amenable to analyses by finite-element approximations, the mathematical aspects presented by Oden are pertinent for the derivation of the governing equations of specialised finite elements for various organ mediums. The chapter by Autman provides a clue to the determination of the *in vivo* nonlinear elasticity of the cervix, which is required to help predict the duration of labour.

#### *Orthopaedic mechanics*

Concepts of structural stability by Roorda are applicable to the spine, a discrete structural system under multiple loading, to help study the mechanics of its deformities and correction procedures. Defects and flaws are created in bones during the insertion of fixation devices and implants, which can lead to bone fracture; Achenbach's chapter can help provide conditions and formulations for fracture under dynamic loading conditions.

#### *Propagation of stress, heat and shock waves in bone, aorta and human body*

Stress and heat propagation in human organs and the body's composite inhomogeneous medium, based on the variational principles of Nemat-Nasser, provide the foundations of the mechanisms of impact-generated trauma and thermotherapy, respectively. The mechanism of aortic rupture, following its impact, is based on the theory of propagation of large amplitude pulses and shock waves, dealt with by Seymour and Mortell.

#### *Human joints*

Alternative approaches to the evaluation of intact human joints can be

developed from the treatments of stress fields in viscometric flow fields of visco-elastic fluids, provided by Pipkin and Tanner.

D. N. GHISTA

**Electrical indicating instruments** by G. F. Tagg. *Butterworths*, 1974. 227 pp., £6

This book has been written by an author of many years experience in the fields of indicating-instrument design and measurement practice, and is intended to embrace, in a single volume, the design, construction and performance of electrical measuring devices. The book begins with a description of the general concepts of the measurement of electrical quantities and, in effect, traces the historical development of electrical metering methods and construction. This is followed by chapters dealing specifically with the mechanical aspects of instrument construction, including design details of suspension and control systems, together with a discussion of the implications of damping, and response times. The properties of some magnetic materials and the design of permanent magnets are covered in a subsequent chapter, and the later chapters deal comprehensively with various types of meters and the construction of scales and pointers.

The book is presented in an attractive format, with diagrams which are both clear and relevant. The author succeeds in maintaining an effective compromise between an adequate theoretical treatment and essentially practical design data; for example, a number of nomograms are included, together with an appendix, which enables the reader to reconstruct them with appropriate dimensions and accuracy. It is stated that the available information on this subject is distributed amongst a vast range of literature. This is evidenced by an extensive bibliography of truly international flavour, which runs to ten pages, listing some 200 references.

This is a textbook which will be welcomed by the specialist instrument designer and students in the field. It is interesting to speculate, however, that its perusal by other physicists and engineers might well persuade them to take that ubiquitous multimeter rather less for granted.

C. A. GREATOREX

# conference report

## Brazilian congress

The 3rd Brazilian congress on biomedical engineering took place in Rio De Janeiro from December 16th to 18th 1975. The main sessions covered computer applications, biomedical instrumentation, cardiology, identification of biological systems, assisted circulation and artificial organs, modelling and simulation, ultrasound, biomechanics and biomaterials. There were two tutorial sessions dealing with ultrasound and the development of an artificial heart. Panel discussions covered the development of teaching and research and co-operation between universities and industry in Brazil. Altogether there were about 60 papers and about 220 participants from all over Brazil. At the conclusion of the congress, a meeting of the Brazilian Society for Biomedical Engineering was held. Viktor Pollak reports that b.m.e. is now spreading away from the Rio de Janeiro-Sao Paulo area to other parts of this vast country, the fifth largest in the world. This is good news indeed!

## BIOMEDICAL ENGINEERING IN OBSTETRICS AND GYNAECOLOGY

The 4th joint meeting of the UK Biological Engineering Society and the Hospital Physicists' Association was held on biomedical engineering in obstetrics and gynaecology at the University of Sussex. Eighteen papers were delivered covering, for example, the *in-vitro* and *in-vivo* application of a vibrating and force measuring dilator; a preliminary assessment of methods for measuring endometrial blood flow in non-pregnant women; electronic control of induced and accelerated labour; applications of thermography in obstetrics and gynaecology; computer model of the foetal circulation; the management of labour using computer techniques and intelligent foetal monitors. Further details from K. Copeland, Biophysics Department, University College, Gower Street, London, WC1, England.

## The importance of close co-operation between medicine and engineering

The 1975 Annual Meeting of the Society for Biomedical Engineering of the German Democratic Republic was held at the Martin Luther University at Halle from September 23rd to 25th. The Chancellor of the University, Professor Poppe, and the Society's President, Dr. Millner, both underlined the importance of close co-operation between medicine, science and engineering. This is typified at Halle by work on medical uses of ultrasound. With an attendance of 330 and the presentation of 80 papers, this was the Society's most significant national meeting. There were 150 physicians, 150 biomedical engineers and 30 students present, with a strong representation of younger workers. The subject topics included: ultrasonics; pacemakers; cardiovascular measurements; data acquisition and processing; e.e.g., e.m.g. and psycho-physiological re-

search; patient monitoring and the testing of organ function.

A new constitution was approved for the Society, and four sections were formed from the previous working groups. The sections cover patient monitoring, automatic information processing, biotelemetry and biomedical engineering in clinics and hospitals. Meetings will be held every two years with section meetings in the alternate years. The Society's secretary spoke about the serious efforts now being made to promote the compulsory education of middle-grade medical staff in biomedical engineering and the introduction of this subject as a new discipline at the Carl Zeiss College at Unterwellenborn. The next meeting of the Society will take place jointly with a meeting of the GDR Society for Experimental Medicine in 1977.

## Biomedical transducers

Biocapt '75, an international conference on biomedical transducers, was held in Paris from 3rd to 7th November 1975. The conference was sponsored by Mme. Simone Veil, French Minister of Health, and was organised by the following groups: Federation Nationale des Industries Electroniques (FNIE), Union des Associations Techniques Internationales (UATI), Societe des Electriciens, et des Radioelectriciens (SEE), membre de l'EUREL, with the initiative of the section 'techniques bio-medicales' of the SEE affiliated to the International Federation for Medical and Biological Engineering. Participation was indeed international for, in addition to a large representation from France and other European countries, the USA, Britain, Canada, Australia, Japan, India, Poland, and the USSR were also well represented. Three scientific sessions were conducted simultaneously, each in one of the beautiful conference halls in the UNESCO building. Simultaneous translation in either French or English was provided. A sampling of the scientific programme included papers on biopotentials, bionics,

biomipedances, measurement of blood pressure and flow, physical/chemical measurements in anaesthetics, bio-images, processing and transmission of bio-signals, computer-aided data retrieval, and image processing. There was also a number of workshops in which both physicians and engineers elaborated on problems in such specific areas as anaesthesiology, intensive care, and safety standards.

## Second conference

R. J. Plaszczynski served as chairman of the organising committee and M. LaBalme was chairman of the scientific committee. The success of the conference can be traced directly to their efforts.

The proceedings of the conference are contained in two volumes. Readers interested in obtaining copies may direct enquiries to either Mr. Plaszczynski or Mr. LaBalme at Thomson Medical-Telco, 6 Rue Vauguyon BP 60, 92-Saint Cloud, France. Plans are already underway for a second conference in 1978 to be entitled Bio-Sigma '78.

# The Intek Cardiomat Electrode. It'll change your whole approach to ECG monitoring.



Up to now, in-theatre ECG monitoring has been an awkward business. For both you and the surgical team.

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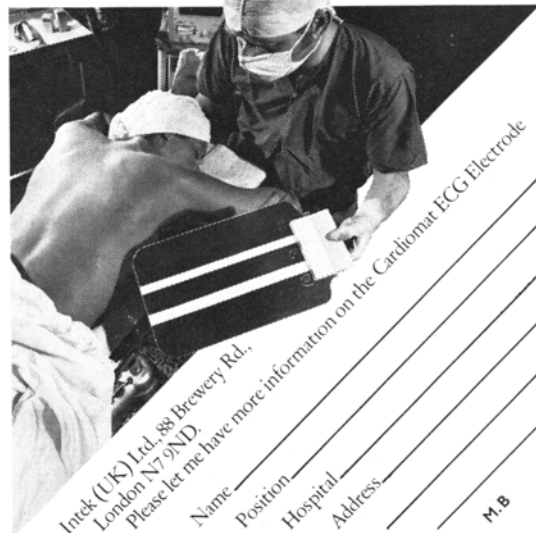
The Cardiomat's large contact surface substantially reduces the risk of patient burns that might result from faulty diathermy.

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Intek Cardiomat electrodes have already been used in over 1 million surgical procedures in the USA, Holland, W. Germany, France and Scandinavia. In conjunction with a very wide range of cardioscopes.

Not surprisingly, they're already proving popular in UK hospitals too.

The mats themselves cost up to 20% less than the more time-consuming alternatives. And the initial evaluation pack of 1 clip and 40 Cardiomats is only £48. For a free demonstration, or further details, just fill in the coupon.



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Hospital \_\_\_\_\_  
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M.B



## Joint simulators and artificial joints

A one-day meeting on joint simulators and the evaluation of artificial joints was held at the University of Leeds on January 16th 1976 and was jointly sponsored by the UK Biological Engineering Society and the Bioengineering Group for the Study of Human Joints of the University of Leeds. Papers covered: Pressure measurement in a hip-joint simulator; A knee-joint simulator; The development of a pendulum and simulator for studies of friction in hip joints and Problems associated with fatigue testing. Details from Prof. V. Wright, University of Leeds Rheumatism Research Unit, School of Medicine, 36 Clarendon Road, Leeds LS2 9PJ, Yorkshire, England.

## CARDIOLOGY CONGRESS

The venue for the 15th Argentine congress on cardiology was Mar del Plata, Province of Buenos Aires, Argentina, from October 26th to 31st 1975. There were approximately 1200 participants and more than 300 papers, together with workshops on special subjects, invited conferences, panels and short courses. Further details and copies of the abstracts can be obtained from Dr. Horacio Cingolani, 51 e/29 y 30, XV Congress of Cardiology, 1900 La Plata, Buenos Aires, Argentina.

## BIOFEEDBACK AND MEDITATION

The Albert Einstein College of Medicine and the Institute for the Study of Human Knowledge cosponsored a weekend symposium in November 1975 on biofeedback, meditation and self-regulatory therapies. Recent scientific developments were reviewed in the self-control of psychophysiological processes and an assessment made of the therapeutic applications of mind/body self-regulation in areas such as hypertension, cardiac arrhythmias, stress syndrome, muscular rehabilitation and the use of drugs. Further details from Dr. Mel Roman, Psychiatry Department, Albert Einstein College of Medicine, 1165 Morris Park Avenue, Bronx, NY 10461, USA.

## 3rd Argentine symposium on cybernetics

The 3rd Argentine symposium on cybernetics was held at Vaquerias in the Province of Córdoba, Argentina, from September 19th to 21st 1975, with 130 participants and 60 papers presented. Some of the papers of interest to readers of *MBE* were: 'Mechanoreceptors in processes of regulation and control', by J. A. Valciukas and Miguelina Guirao; 'Analogue simulation of rapid eye movements (e.m.)', by M. Pascual, G. Winzer and M. Valentinuzzi; 'A mathematical model of r.e.m.', by M. E. Valentinuzzi and O. Pompeiano; 'Random optimisation applied to biological processes', by J. Morales; 'Discrete operators', by M. E. Valentinuzzi and S. L. Kalla and 'Searching edges on biological images', by S. De Lillo and S. Levaldi. Further information and copies of the symposium digest can be obtained from L. F. Maltese, Corrientes 165, 5000 Córdoba, Argentina.

The Institution of Electronics and Telecommunication Engineers (India) organised a symposium on bio-electronics at Ahmedabad on December 19th to 20th 1975, to focus attention on biomedical instrumentation, patient health-care systems, computers in medicine and environmental monitoring systems.

## Exhibition of biomedical instruments

There was also an exhibition of biomedical instruments during this symposium. The proceedings of the symposium are being printed and made available to all participants.

Further details may be obtained from Dr. Ram K. Vepa, Chairman, Programme's committee, The Institution of Electronics and Telecommunication, 2, Institutional Area, Lodi Road, New Delhi 110003, India.

## International background for medical-engineering conference

The Northeast shared medical-engineering services conference, held at Portland, Maine, in June 1975, was an important meeting because of its international US-Canadian background. Taking part were representatives from the Northern New England Clinical Engineering Programme (Maine, New Hampshire and Vermont), Massachusetts Shared Clinical Engineering Services, the New Brunswick Medical Engineering Group and the Nova Scotia Medical Engineering Service. There was a unanimous agreement that the in-service training of nursing and paramedical personnel by medical-engineering staff in safety and instrumentation was an absolute requirement.

tenance and repair of electromedical equipment as has traditionally been the case. Both Canadian and US electrical codes regarding electrical matters are in a state of flux. It was agreed that 'looping' of earth and neutral wires is unsuitable for all patient-care areas. A second Northeast conference is planned for the Autumn of 1976 in Halifax.

## Apprehensive

Manufacturer's sales and service representatives were depicted as being quite apprehensive about medical-engineering staff encroaching on their areas of activity and concern. It was suggested that, in the near future, a medical engineer in the hospital may have overall responsibility for all aspects of technology in hospitals and not merely the main-

## AAMI TUTORIAL ON CLINICAL ENGINEERING

The Association for the Advancement of Clinical Instrumentation (AAMI) ran an interesting tutorial on the practice of clinical engineering from January 8th to 9th in Washington D.C. The emphasis was placed on day-to-day problems and solutions in clinical engineering in a wide variety of environments by speakers with experience in operations, maintenance and development where these applications have shown a success in lowering health costs, upgrading quality and making health-care delivery more accessible.

## Electromagnetic compatibility

Under contract from the US Department of Health, Education and Welfare, the McDonnell Douglas Astronautics Company (East) has prepared a draft electromagnetic compatibility standard for medical devices. The draft standard establishes minimum levels of electromagnetic emissions which medical devices are allowed to produce and it establishes minimum levels of electromagnetic interference to which medical devices must not be susceptible. A section containing test methods is included to provide a consistent means of verifying compliance with the requirements. Tests are described for radiated emission from the device; conducted susceptibility, i.e. the susceptibility of electrical or electronic equipment to electromagnetic energy injected on to its power leads; conducted emission on all power leads; transient susceptibility of the equipment to spike interference on nonearthed power lines; radiated susceptibility, i.e. the susceptibility of electrical and electronic devices to radiated electromagnetic interference. The frequency range considered varies with the tests; for example, the conducted broadband emission limits are considered from 1 kHz to 10 MHz, while the conducted-susceptibility tests cover from 30 Hz to 30 MHz. The devices to which this draft device standard is applied are categorised into: critical equipment—these are life-sustaining devices whose failure would place a

patient in immediate jeopardy; Non-critical equipment—these are devices which are not required to sustain life. Failure of one of these devices would not place the patient in immediate jeopardy. The devices are also categorised into classes according to the location within a medical facility for which they are intended for use: Class 1—any area; Class 2—only in operating room and psychiatry areas; Class 3—all areas except operating rooms and psychiatry areas; Class 4—clinical laboratories only. Enquiries concerning the draft standard can be sent to R. J. Hoff, Department E411, McDonnell Douglas Astronautics Co., PO Box 516, St. Louis, Miss. 63166, USA.

## New Rehabilitation Centre

Construction has started on a five-storey 100-bed spinal-cord injuries rehabilitation centre at the West Roxbury Veterans Administration Hospital in America. In addition to providing facilities for chronic patients, the centre will also provide intensive rehabilitation for the largest concentration of ex-servicemen with acute spinal-cord injuries anywhere in the world. In 1974, a similar spinal cord injuries centre with 30 beds was established at the Palo Alto V.A. Hospital in affiliation with Stanford University.

## PRESIDENT FOR INDIAN SOCIETY

Wing Commander Murali writes from Madras to let us know that Dr. K. N. Sharma, chairman of the Physiology Department at St. John's Medical College, Bangalore, has been elected President of the Society for 1976/78 with Prof. B. L. Deekshatulu of the School of Automation, Indian Institute of Science, Bangalore, as the Vice-President. The Secretary is Dr. T. M. Srinivasan, BME Division, Indian Institute of Technology, Madras-600 036 and the Treasurer is Dr. K. M. Patil of the same address.

## Bioengineering conference

The topics for the 4th New England bioengineering conference to be held at Yale University from May 7th to 8th, 1976 include: artificial organs/prosthetic devices; biomedical engineering; biocontrol systems; biomaterials; biomechanics; biomedical education; biophysical measurements/bioinstrumentation; biosignal processing/biocommunication; cardiology/haemodynamics; computers in medicine; imaging/ultrasonics; mathematical modelling of biological systems; pattern recognition; thermal regulation of biological systems. Details from: Prof. Subrata Saha, Department of Engineering & Applied Science, Yale University, Becton. Cente, 15 Prospect Street, New Haven, Ct. 06520, USA.

## Digitimer D130



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## SPIKE PROCESSOR

An instrument of advanced design that provides, in one unit, many of the facilities required by electrophysiologists wishing to show a correlation between the mean rate of firing of nerve cells and some external activity.

The D130 consists, basically, of a window discriminator followed by a 3-decade counter with a D/A converter. A LED display indicates the number of spikes (positive or negative going) counted during the previous timing period and a recorder output allows a histogram to be simultaneously plotted.

Four modes of operation are possible:  
STORE, in which the spikes counted in a period are stored and then displayed and/or recorded.  
DIRECT, allowing direct observation of the count as it occurs.  
SINGLE, giving one cycle of operation and a display of the count obtained.  
GATED, which provides for external trigger pulses to start and stop the count.

To assist setting up, a monitor output is provided which allows the two discriminator thresholds to be displayed on an oscilloscope.

DDL 5333

# future conferences

## Medical devices in health protection

To commemorate the centennial of the introduction of legislation pertaining to the safety of food and drugs in Canada, the Health Protection Branch of the Canadian Department of National Health and Welfare and the Canadian Association of Manufacturers of Medical Devices will, in 1976, jointly host the 1st Canadian conference on medical devices in health protection. The subjects to be discussed include: professional, industry and user viewpoints, device regulations and implications, compliance, notification, regulatory mechanisms, recalls, product development, quality control and good manufacturing practice, maintenance and training. Major developments of trends and problems in the health-care field, especially in the two key areas of *in-vitro* diagnostics and sterilisation, will be reviewed by Canadian and international speakers. For further in-

formation contact: Dr. A. K. Das-Gupta, Director, Bureau of Medical Devices, Health Protection Branch, Department of National Health and Welfare, Ottawa, Ont. K1A 0L2, Canada.

## RECORDING AND PROCESSING DATA

The Austrian Society of Biomedical Engineering is holding a meeting on the recording and processing of biological data, in Graz from May 21st to 22nd 1976. The subject matter encompasses: mathematical modelling and simulation of biological data; analogue and digital signal processing; patient monitoring; pattern recognition; transducers and telemetry. The proceedings will be published. Further details from Dr. R. Waibel, Osterreichische Gesellschaft fur Biomedizinische Technik, 8010 Graz, Inffeldgasse 18, Austria.

## ÆBM's 29th annual conference

The Alliance for Engineering in Medicine and Biology is busy planning its 29th Annual Conference to be held at the Sheraton-Boston Hotel, Boston from November 6th to 10th 1976. The programme will include: physiological systems modelling; biomechanics; biomaterials; artificial organs; research and clinical instrumentation, computer science,

rehabilitation engineering, clinical engineering, health-care systems analysis and the role of biomedical engineering. The 30th conference will be in Denver, Colorado, in 1977. Details from Patricia Horner, Alliance for Engineering in Medicine and Biology, Suite 1350, 5454 Wisconsin Avenue, Chevy Chase, Maryland 20015, USA.

## CHALLENGE FOR ERGONOMICS

The 6th congress of the International Ergonomics Association will be held from July 11th to 16th 1976 at the University of Maryland, College Park, Maryland. The Human Factors Society will be host to the congress. The congress theme is 'Old world, new world, one world'. The technical programme will give visibility to ergonomic efforts from throughout the world and will address new and challenging questions confronting ergonomics as an international discipline. Details from Harry Davis, Congress Chairman, Human Factors Section B-56 KPD, Eastman Kodak Company, Rochester, NY 14650, USA.

## COLOUR REPRODUCTION

The 29th annual conference and seminar on colour reproduction, organised by the US Society of Photographic Scientists and Engineers, will be held from May 23rd to 28th at the Barbizon Plaza Hotel, New York. The section on medical radiography will include: screen film systems; ionography; the X-ray spectrum and diagnostic and therapeutic radiography. There will also be sessions on holography, photomicrography and medical photography. Further details from R. H. Wood, Society of Photographic Scientists and Engineers, 1330 Massachusetts Avenue N.W., Washington D.C. 20005, USA.

## Artificial organs

The 22nd annual meeting of the American Society for Artificial Internal Organs took place in San Francisco from April 1st to 3rd 1976, with workshops on uraemia and oxygenation. There were also a number of interesting working lunches covering adsorbent haemoperfusion; pericarditis in renal failure, treatment of acute renal failure, assessing quality of maintenance dialysis, dialyser re-use, leechables from medical devices, requirements of elastomeric devices, respiratory support registry; developments in vascular prostheses, developments in vascular access, and wound healing at artificial organ interfaces. Further details of the meeting or of the Society from the ASAIO National Office, Box 1507, Boca Raton, Fla. 33432, USA.

## 11th Congress on neurology

The World Federation of Neurology will hold its 11th congress from September 11th to 16th at the International Congress Centre RAI in Amsterdam, Holland. The organisation of the meeting has been entrusted to the Netherlands Society of Neurology. The main themes of the congress will be neuromuscular disorders; neuro-immunology; disturbances of consciousness and cognition and geographic factors in neurology. It is expected that there will be about 900 free papers and that approximately 2500 participants, will attend. The President of the congress is Dr. W. A. den Hartog Jager, professor of neurology at the University of Amsterdam. The official languages are English, French.

### Information

German and Spanish. Simultaneous translations in these languages will be provided at the plenary sessions. Further details from the Conference Secretariat, c/o Holland Organising Centre, 16 Lange Voorhout, The Hague, Holland.

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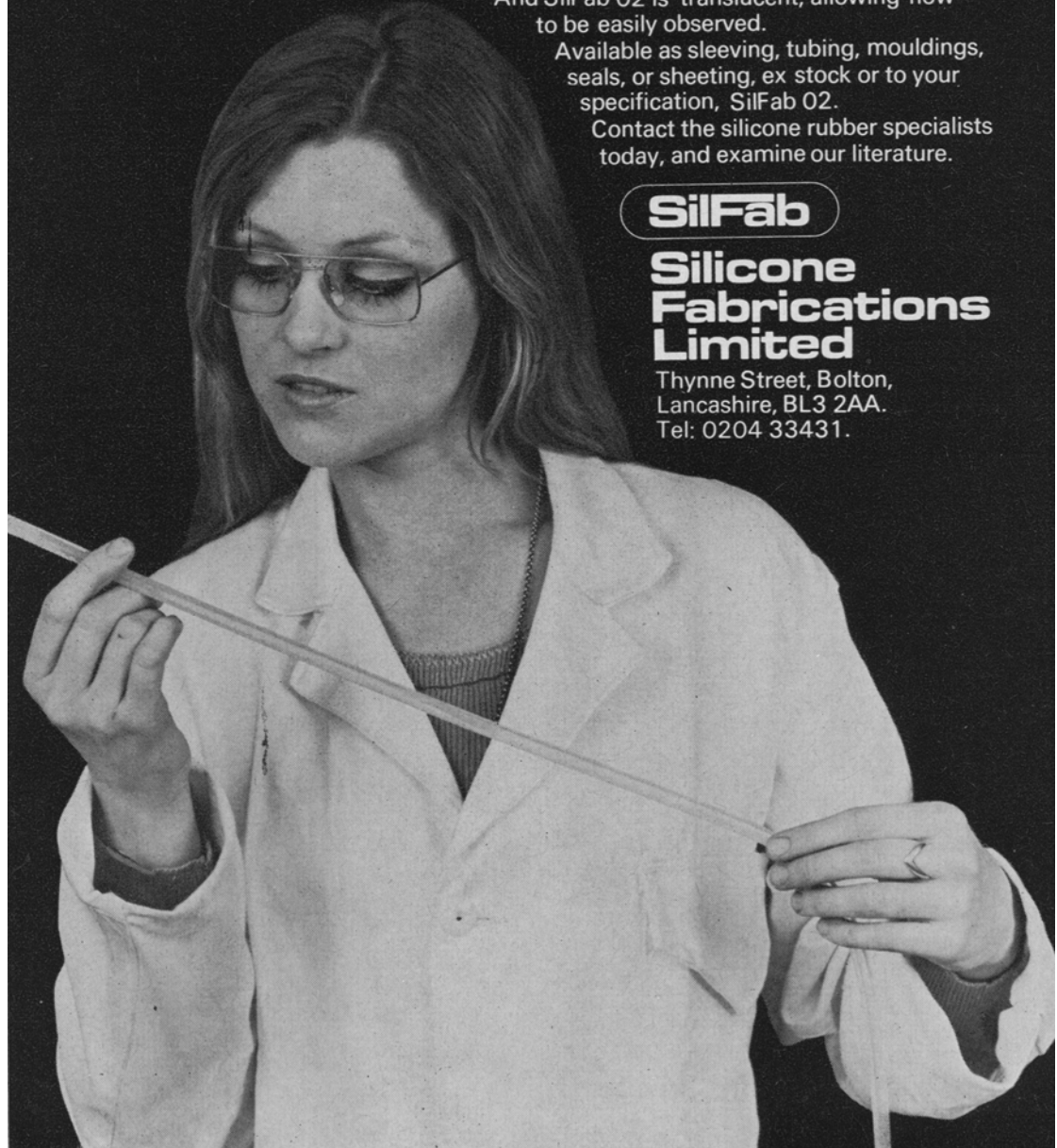
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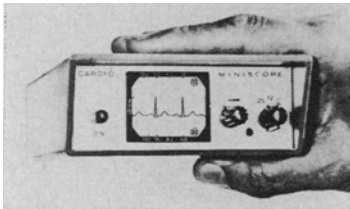
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# new developments

## CARDIOSCOPE

This miniature cardioscope measures  $45 \times 110 \times 180$  mm and weighs 790 gm. Intended as a diagnostic aid, whether part of the doctor's bag, the comprehensive hospital scene, emergency services or in industrial medicine, the electrodes are an integral part of the unit and are simply pressed against the chest to the left of the sternum. Controls are confined to an on switch and 2-speed sweep selector. Recognition of a disturbed cardiac rhythm, from normal to 'weak', asystolia, fibrillation, tachycardia etc., from an e.c.g. display approximately equivalent to the 2nd Einthoven limb lead



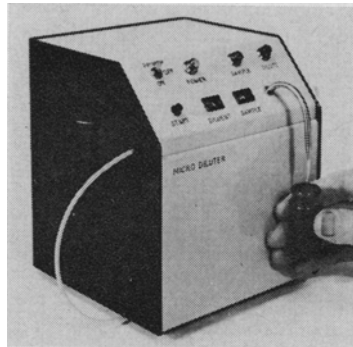
is possible. Scales are for heart rates of 30 to 80 and 60 to 180 on 12 and 25 mm/s sweep with constant 1 mV calibration. Sensitivity is adjustable from conventional e.c.g. size to four times amplification of a weak signal. Optional extras include plug-in electrodes for child and infant use, single electrode with one cable for use in cardiological precision diagnostics, and a viewing hood for bright outdoor use. Available shortly will be a small plug-in accessory unit, for paper recording similar to an e.c.g.

*Andrew Stephens (1947) Co., Medical Electronics, 41 Dickson Road, Blackpool, Lancs., England.*

## DILUTER

This instrument is suited to r.i.a. functions or applications involving very small volumes. The sample volume is continuously adjustable over the range 0.005 to 0.1 ml and the diluent from 0.005 to 1.0 ml. A combined diluent syringe and valve is incorporated to minimise the dead volume of the Microdiluter and only one sample syringe is used to cover the entire range. Front-panel digital indicators display the exact micro-litre settings of both sample and diluent. Accuracy is better than 1%

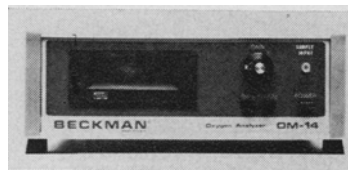
and the instrument will dilute samples at the rate of ten per minute.



*Hook & Tucker Instruments Ltd., Vulcan Way, New Addington, Croydon, Surrey CR0 9UG, England.*

## OXYGEN ANALYSER

The model OM-14 oxygen analyser is designed to accept injected or pumped-through samples and display digital readout of percentage  $O_2$  or  $pO_2$  in millimetres of mercury. A chart recorder can be plugged in



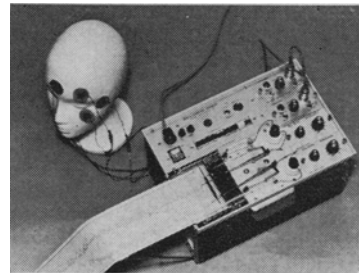
and resolution is 0.01%. Detection is by means of a long-life polarographic sensor which is disposable, thus avoiding changing sensor membranes and gel.

*Beckman Instruments International SA, PO Box 308, CH-1211 Geneva 6, Switzerland.*

## ELECTRONYSTAGMOGRAPH

The Washington 400 MD1 single-channel and 400 MD2 dual-channel electronystagmographs are designed for routine clinical vestibulometric investigation and research. As is well known, movement of the eyes in both the vertical and horizontal axes produces a small potential between the cornea and the fundus. In the case of nystagmus, this potential rises and falls according to the intensity of the movement. Using suitable electrodes placed either to each side and/or above and below the eyes, the potential is detected, amplified

and used to produce a single-pen trace in the case of the 400 MD1 or a dual-pen trace in the case of the 400 MD2. The traces provide a permanent documented record and allow an overall qualitative and quantitative assessment to be made of each facet of nystagmus. These include the velocity of the slow-vestibular-phase, the duration, and the number of beats or amplitude of the central phase. Asymmetries and dysrhythmias can also be readily recognised. The instruments



are equipped with time and event markers, the former providing second or minute time marks alongside the trace, the latter being operated by front-panel push button or remote control. Both these facilities are of considerable use for recording the duration of nystagmus following a given stimulus.

*Aural-Aide Ltd., 2/4 London Road, Southampton, SO1 2AF, England*

## MICRONEPHELOMETER

The Mark IV Micro-Nephelometer was developed in association with ICI and provides a direct digital readout, obviating the use of conversion factor tables. Operation is based on the light-scattering effect of particles in suspension, the degree of scatter being affected by particle size, suspension concentration, wave length of incident light, the angle at which the scattered light is measured and other factors such as characteristics and location of the light sensing device. The design of the Mark IV reduces to a constant all factors other than those directly associated with the sample under test, and then provides a direct readout which can be related to particle concentration. The instrument is supplied with all necessary

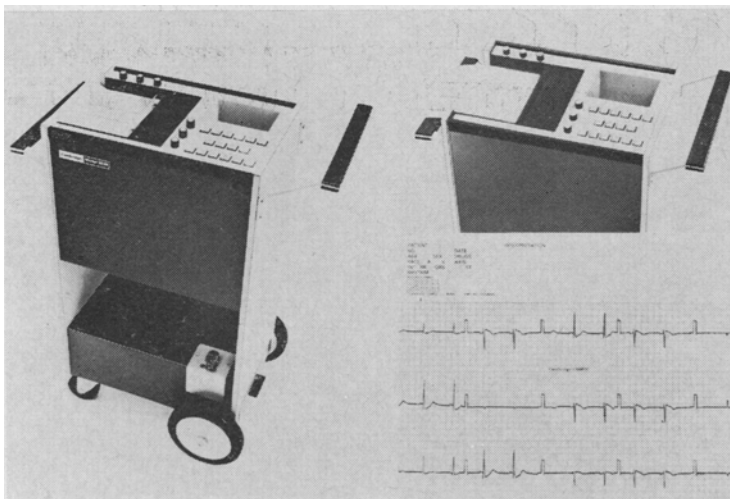
accessories and a reference standard to enable a calibration check to be carried out before use. The Mark IV



Micro-Nephelometer will provide quantitative lipid profiles for batches of 30 or more samples in 1h. *Scientific Furnishings Ltd., 183 London Road South, Poynton, Stockport, Cheshire SK12 1LJ.*

#### PULSE-RATE AMPLIFIER

The model 13-4214-06 pulse rate amplifier is designed for use in conjunction with a transducer to provide noninvasive monitoring of mechanical heart activity. The solid-state unit monitors peripheral blood-pressure signals from a finger-pulse, ear-pulse or carotid-pulse transducer and heart sounds from a heart-sound transducer. It provides simultaneous outputs for pulse waveform and pulse-rate recording and display. The range of rates that can be measured is 25 to 250 beats per minute. A long-life light-emitting diode on the front panel flashes with each pulse. The unit has a built-in power supply that also provides regulated constant-current excitation for finger and ear pulse sensors. *Gould Advance Ltd., Raynham Road, Bishop's Stortford, Herts.*



#### AUTOMATIC E.C.G.

This 3-channel automatic e.c.g., known as the model 3038, has a wide range of facilities including a 'semi-automatic' mode in addition to automatic and manual operation. The unit is trolley mounted, highly manoeuvrable and is 35cm (13.5 in) wide.

The writing system incorporates a newly developed servomotor, a precision rectilinear convertor and the curved-wire writing stylus.

Hard-wired lead programmability, preset to user preferences, provides additional flexibility. In classic lead groups 1 to 4, the recording time interval can be adjusted to 2.5 or 5 s per group. Group-5 recording-time interval can be set independently of the other groups to 0, 2.5, 5 or 10 s. Any three of the classical 12 leads or the Frank XYZ leads can be recorded in this group. A number of optional facilities are available, including a heart-sound/pulse-wave module, computer interface and high-speed paper drive.

*Cambridge Instruments, Melbourn, Royston, Herts, England.*

#### DATA RECORDER

The RMG-5104 4-channel cassette tape recorder is designed to fulfil most biomedical signal-recording requirements. Features include an S/N ratio of greater than 50 dB, a frequency range of d.c. to approximately 1 kHz (-3 dB), closed-loop dual-capstan system, hysteresis synchronous motor to minimise wow and flutter, and the added functions of pause button, memory rewind and

automatic tape-end stop. The unit weighs about 6 kg.

*Nihon Kohden Kogyo Co., Ltd., 31-34 Nishiochiai 1-chome Shinjuku-ku, Tokyo, 161 Japan.*

#### VENOUS-FLOW STIMULATOR

This venous-flow stimulator is claimed to be the most effective system so far devised to eliminate the risk of post-operative thrombosis. Developed by Dr. V. C. Roberts and L. T. Cotton of King's College Hospital Medical School, in collaboration with Medishield, the appa-



ratus consists of inflatable leggings which fit over the patient's feet and lower calves, and a small pressure cycled, electronically timed pneumatic unit connected to an oxygen supply.

*Medishield Co. Ltd., Hammersmith House, London W6 9DX.*

#### US conference

The 29th annual conference on engineering in medicine and biology will be held in the Sheraton Hotel, Boston, from November 6th to 10th 1976. The main areas to be covered are: physiological systems modelling; biomechanics; biomaterials; artificial organs; research and clinical instrumentation; computer science; rehabilitation engineering; clinical engineering, health-care systems analysis and the role of biomedical engineering. Details from the 29th ACEMB, Suite 1350, 5454 Wisconsin Avenue N.W., Washington, D.C. 20015, USA.

## REPORT FROM UK ROYAL COMMISSION ON ENVIRONMENTAL POLLUTION

The fifth report of the UK's Royal Commission on Environmental Pollution recommends the formation of a central organisation to be known as Her Majesty's Pollution Inspectorate. It would cover all forms of pollution, whether gaseous, liquid or solid, from industrial processes which present technologically difficult problems. In their report, the commissioners argue 'Pollution of the air cannot be looked at in isolation from pollution

of land or water. The reduction of emissions to the atmosphere can lead to an increase in wastes to be disposed of on land or discharged in water and vice versa. The realities of pollution control require a continuing balance to be struck between the costs and benefits of pollution abatement for industry and society'. The Report is available as Command 6371 from Her Majesty's Stationery Office at £1.75.

## Thermistors for biomedical use

Reprints of a 13-page paper 'Thermistors for biomedical use', given by Meyer Sapoff at the 5th symposium on temperature are available on request from Thermometrics Inc., 15 Jean Place, Edison, New Jersey, NY 08817, USA. The paper reviews the various types of thermistors which have been found to be most suitable for biomedical applications. For each thermistor structure considered, the relationships which exist between

the structure are presented, its fabrication methods and the cost of maintaining close tolerances and interchangeability. The testing and calibration problems peculiar to biomedical sensors are discussed and a qualitative account of the factors is given which affect the stability of thermistors along with quantitative data pertaining to the capabilities of each thermistor type.

## TWENTY YEARS ON

Twenty years ago, in 1955, there were 28985 cases of poliomyelitis reported in the USA, and of these 13 850 involved paralysis. In contrast, since the start of 1975, only 5 new cases have been reported in the USA. In the state of Massachusetts not a single new case of the infection has been reported since 1969. However, in 1969, a survey of 88 439 children entering kindergarten in 1 461 schools revealed that 7 032 children had not been inoculated against polio.

### Freedom from disease

Continued freedom from the disease demands regular immunisation of all children from early infancy. The least protection exists principally in disadvantaged urban and rural groups. Most cases of paralytic polio in recent years in the USA have occurred in these populations. This information was taken from the Massachusetts Hospital News.

## What do you get when you set your filter?

Often after you've fed in an oscillator and displayed the results, you're left with time-consuming calculations for corner frequency, high-pass-low pass interactions and insertion loss.

The Ithaco 4210 series filter is so precise that you can read -3dB bandwidth, insertion loss, noise bandwidth and filter gain from a chart printed on top of the instrument case.

- \* A Butterworth response is used in the normal mode and a Bessel response in the pulse mode to preserve phase coherence (e.g. in pulse work).
- \* Options for internal battery with charger, 40dB post-filter gain, and remote preamplifier powered from filter.

- \* Competitively priced
- \*  $\pm 1\%$  frequency accuracy
- \* Rolloff is 24dB/octave per section to a full 90dB attenuation
- \* High pass, low pass, bandpass

The specifications of the 4210 and other Ithaco filters are better than most. Read about them in leaflet IAN 101



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## Evaluation of artificial muscle system

The Columbus, Ohio, Laboratories of the Battelle Research Institute are engaged in the development and evaluation of an artificial muscle system which might ultimately substitute for one of a pair of antagonistic muscles in the human body. Dr. David Gardner, principal investigator of the study team, says that the artificial muscle is a passive device which functions like a rubber band.

### Artificial tendon

For example, if a person could straighten an arm, but could not bend it back, the built-in tension of the artificial muscle would allow the arm to return to its bent position. The three year study is funded from an 80 000 dollar grant from the US Department of Health, Education and Welfare's National Institute of Arthritis, Metabolism and Digestive Diseases. The device is a silicone elastomer tube surrounding another tube of Dacron fabric. The Dacron, serving as an artificial tendon, protrudes from both ends of the silicone tube for attachment to a natural tendon or possibly to the bone itself.

### Freedom of movement

Inside the wider central portion of the 'muscle', the fabric is pleated and bunched together to give the muscle's 'belly' freedom of movement. The length of the fabric limits the extension of the artificial muscle and keeps an arm or leg from bending beyond the straight position. Dacron and silicone are the materials showing the greatest potential for use because they are biocompatible and appear to function internally without adverse effects on the body. Other materials, such as polyurethane elastomers, are

also being investigated. The Battelle team is currently studying tension in natural muscles to ensure that each artificial muscle will have the same muscle tone as the one it replaces. Later in the study the devices will be surgically implanted in sheep. Dr. Gardner feels that the most striking feature of the artificial muscle is its ability to function internally. Although a number of artificial muscles are now available, they are worn externally and are often cumbersome and cosmetically unattractive. In the USA, there are approximately 800 000 patients suffering from muscular dystrophy, strokes, cerebral palsy, muscular atrophy and other problems who might benefit from the proposed device which will require at least three to five years before it can be offered for clinical evaluation. Enquiries to Richard Falb, Manager, Bioengineering/Health Sciences Section, Battelle Columbus Laboratories, 505 King Avenue, Columbus, Ohio 43201, USA.

## OBITUARY

### Alistair Bottomley

Sadly, we must announce the death of Dr. Alistair Bottomley at an early age. Alistair was well known for his work on e.m.g. studies and the development of e.m.g. controlled prostheses in the Department of Physical Medicine at St. Thomas's Hospital, London. He subsequently moved to BRADU (The Biomechanics Research and Development Unit of the Department of Health and Social Security). For many years he was a loyal supporter of the Biological Engineering Society.

## MORE CO-OPERATION NEEDED

More exchange of engineering information is needed between research and development departments of commercial electronics companies and medical physicists working in obstetrics departments in hospitals, said Prof. R. W. Beard of St. Mary's Hospital, London, speaking at the colloquium on patient monitoring held at the Institution of Electrical Engineers during November 1975. He went on to say that electronics technology had developed to such an extent that it was not the electronics which was failing, but rather its application in a particular monitoring situation, and the interpretation of the results. Since foetal monitoring had come into widespread use at St. Mary's Hospital, there had been a remarkable drop in the number of stillbirths and deaths in the first week after birth for babies born in the hospital.

## Second edition of handbook on control valves

The Instrument Society of America has published a second edition of its Handbook of control valves. The editor in chief is James Hutchison, and the book runs to 533 pages. With a hard cover the cost is \$35 and there are 13 chapters of text. Some of the topics covered are: valve bodies, valve trim, flow characteristics of valves, control valve actuators, selection of materials of construction, maintenance of control valves, and installation practices. Further details from: The Instrument Society of America, Publications Department, 400 Stanwix Street, Pittsburgh, Pa 15222, USA.

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