

# Correspondence

## Naming the Units

THE letter to which these correspondents refer (*Nature*, 219, 765; 1968) was written by Professor George Gamow shortly before he died.

SIR,—Professor Gamow proposes names to be applied to a new series of units  $10^9$  greater than those in current use: the thought of adding yet another unit of length (for example) to the thirty or so already in use in Great Britain is frightening indeed. Professor Gamow finds the SI prefix giga (G :  $10^9$ ) unfortunate and one must agree that all the names mega (M :  $10^6$ ), giga (G :  $10^9$ ) and tera (T :  $10^{12}$ ) relating as they do to Roman and Greek giants and monsters rather than to the power indices 6, 9 and 12 could be improved on. But there is an overwhelming measure of international agreement for their use. The real need now is for the naming on a logical basis of new prefixes carrying the series up into the range of  $10^{15}$ ,  $10^{18}$  and so on.

For example, in the energy industry generally the joule is inconveniently small and in particular when dealing with national energy outputs even the terajoule is too small.

Is there some exotic language which provides readily voiced prefixes suggesting 15, 18 and so on with initial letters acceptable for use as abbreviated forms?

As an interim and somewhat retrograde step pending international agreement on such further prefixes, we can revert to the use of compound prefixes: the teraterametre (Ttm:  $10^{24}$  metres), for example, would be unambiguous and could cope immediately with cosmic distances.

The case for avoiding new unit names may be pointed by arguing the extreme (and currently impracticable) proposition that, with everyone using the same system, units need not be named at all. For example, even now, few in Britain would misunderstand the answers "56", "10-7½-17", "24 front, 26 rear, please", "one eighty", "100 in the shade" and "36-24-36" to the questions, "How old are you?", "What are your shoe/hat/collar sizes?", "What pressures do you want in your tyres?", "What was your weight given as in the United States?", "What was the temperature?" and "Vital statistics", respectively; no units are mentioned but all are clearly understood. Similarly, it was not strictly necessary to apply names to the derived SI units such as that for force (Newton: N: kg m/s<sup>2</sup>). Pascal is being suggested for pressure (Pa: N/m<sup>2</sup>). The adoption of such names, in fact, increases the temptation to invent names for other derivatives or multiples/sub-multiples which can only store up terror once again for future generations of schoolchildren who will have to remember the affiliation of each.

We suggest that, even with the admitted imperfections, there is an overwhelmingly strong case for early world-wide adoption of metrication and decimalization using SI basic units and prefixes together with a firm veto on the creation of any new unit names whatsoever.

Yours faithfully,

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SIR,—The letter from G. Gamow proposing names for units involving  $10^9$  contains some well merited honours such as 1 Rutherford (=  $10^9$  electron volts) and some happy inventions such as 1 inferno (=  $10^9$  °K). However, his statement that the British, *inter alia*, have no name for  $10^9$  is surely very surprising. In adopting SI units, the giga was accepted, being, one may think appropriately, of G.(I) Gamow!

Yours faithfully,

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SIR,—Gamow has suggested names for four large physical quantities,  $10^9$  times the following units: a year (time), a light year (distance), a kelvin degree (temperature) and an electron volt (electrical energy). These large quantities arise in the "big bang" theory of cosmology. The names proposed by him are aeon, hubble, inferno (I<sup>o</sup>) and rutherford, respectively. I should like to make the following comments.

(1) Gamow sets out with the criticism that there are different and confusing names for the number  $10^9$  in the principal languages of Europe and the United States, but finally he suggests no name for this number for universal adoption. Instead, he proposes names for the four physical quantities mentioned. In fact, the Conference International des Poids et Mesures (CIPM), at its meeting in 1948, had approved the names for some large numbers in excess of one million (Jerrad, H. G., and McNeill, D. B., *A Dictionary of Scientific Units*, Science Paperbacks, 1966). They called  $10^{12}$  a billion. (The United States should fall into line.) CIPM at its meeting in 1958 recommended the prefix giga (pron. ji'ga; symbol G) for the multiple  $10^9$ . Thus, for example,  $10^9$  light years oecome giga light years, which may be abbreviated into Gly. GeV for  $10^9$  electron-volts is already common. The prefix giga (G) will serve all quantities and there is really no need for the new names suggested by Gamow.

Two of the proposed names are of famous scientists, but in one case it is apparently suggested that we drop the name of another great scientist, Kelvin, and accept inferno in its place. We honour the great men of science by understanding their works and not by taking their names more often. Naming laws and principles after their discoverers is a different matter.

(2) Sygne (in *Relativity: The General Theory*, 421, North Holland, 1960) has suggested an alternative to the recommendations made by CIPM in 1958, but we may examine the matter *ab ovo*.

Posterity is bound to criticize us for the uneconomical use of the alphabet. (We can blame our forefathers for an unscientific alphabet.) We still coin new words as haphazardly as, probably, the Cro-Magnon man did. (It is interesting to see how the name Googol, for the number  $10^{100}$ , arose, page 58 of *Relativity: The General Theory*.) Often we turn to Greek and Latin for the sake of consensus. Combinations of letters like ab (already an abbreviation for absolute), ac (a.c. is used for alternating current), ad (abbreviation for advertisement), af, and so on, can be used to name various quantities. If af is taken to represent  $10^9$ , fa can conveniently stand for  $10^{-9}$ . Thus elementary combinations of suitable consonants and vowels can yield many new simple words for use in science.

(3) Giving new names to different magnitudes of already familiar units of time, distance, temperature and electrical energy will add to vocabulary without adding to knowledge. At the same time, this may become an obstacle to understanding or a load on memory. Which do you prefer, Hertz or cycles per sec, galileos or cm per sec<sup>2</sup>? Surely a

## International Meetings

December 1–5, **Microbiology**, Panama (Octavio E. Sousa, Apartado 6403, Panama City, Panama).

December 1–5, **Operating Metallurgy**, Cleveland (Jack V. Richard, Metallurgical Society of Aime, 345 E 47th Street, New York, NY 10017, USA).

December 1–7, **Pediatrics**, Mexico (Dr Lazaro Benevides, Organizing Committee, c/o Hospital Infantil de Mexico, Calle Dr Marquez 162, Mexico 7, DF Mexico).

December 2–4, **Western National Geophysical Union meeting**, San Francisco (Dr J. C. Harrison, Department of Geophysical Sciences, University of Colorado, Boulder, Colorado 80302, USA).

December 2–6, **Engineering Materials and Design International Exhibition and Conference**, London (c/o Industrial Trade Fairs Ltd, Commonwealth House, 1–19 New Oxford Street, London WC1).

December 2–7, **Uses of Analogue and Digital Techniques**, Tucson (Dr J. W. Harshbarger, c/o University of Arizona, Tucson, Arizona 85721, USA).

December 3–5, **Foetal Autonomy**, London (CIBA Foundation, 41 Portland Place, London W1).

December 3–6, **Computers on Board Satellites**, Paris (Centre National d'Etudes Spatiales, 129 rue de l'Université, Paris 7, France).

December 4–6, **Wire and Cable**, Atlantic City (J. Spergel, US Army Electronics Command, Amsel-Kl-EE, Fort Monmouth, NJ 07703, USA).

December 4–6, **Circuit Theory**, Miami Beach (Group on Circuit Theory, Institute of Electrical and Electronics Engineers, 345 E 47th Street, New York, NY 10017, USA).

December 6–7, **International Cartographic Association**, Dehra Dun (Dr S. P. Chatterjee, Indian National Committee for Geography, 1 Acharya Jadagish Bose Road, Calcutta 20, India).

December 9–11, **Computer Conference**, San Francisco (American Federation of Information Processing Societies 211 E 43rd Street, New York, NY 10017, USA).

December 12–14, **Nuclear Energy Conference**, Milan (Milan Federation of Scientific and Technical Associations, Piazzale Rodolfo Morandi 2, Milan, Italy).

December 12–17, **Phase Transformation**, Canberra (Professor G. D. Garland, International Union of Geodesy and Geophysics, c/o Geophysics Laboratory, University of Toronto, Toronto 5, Canada).

December 16–20, **Relativistic Astrophysics**, Dallas (Dr Ivor Robinson, South West Centre for Advanced Studies, PO Box 30365, Dallas, Texas 75230, USA).

December 18–20, **American Physical Society meeting**, San Diego (Professor W. Whaling, California Institute of Technology, 1201 East California Street, Pasadena, California 91109, USA).

December 26–31, 135th meeting of the **American Association for the Advancement of Science**, Dallas (Mrs Thelma C. Heatwole, Public Information for Annual Meeting, 5110 West Franklin Street, Virginia 23226, USA).

December 27–30, **Institute of Mathematical Statistics meeting**, Washington (Joan R. Rosenblatt, 337 Administration Building, Gaithersburg, NBS, Washington DC 20234, USA).

January 6–10, **Phase Transformations**, Canberra (Dr D. H. Green, c/o Department of Geophysics and Geochemistry, Australian National University, Canberra, Australia).

January 6–11, **Caribbean Chemical Conference**, Cave Hill, Barbados (Dr R. C. Russell, Chemistry Department, University of the West Indies, PO Box 64, Bridgetown, Barbados).

## FORTHCOMING EVENTS

(Meetings marked with an asterisk are open to the public)

## Monday, October 21

INSTITUTION OF ELECTRICAL ENGINEERS (at Savoy Place, London, WC2), at 10 a.m.—Colloquium on "Electrical Passenger Vehicles".

SOCIETY OF CHEMICAL INDUSTRY, PESTICIDES GROUP (at 14 Belgrave Square, London, SW1), at 5 p.m.—Dr N. G. Morgan: "Spray Application Efficiency in Fruit Crops".

BRITISH SOCIETY FOR THE HISTORY OF SCIENCE (in the Lecture Theatre of the Science Museum, Exhibition Road, London, SW7), at 5.30 p.m.—Dr Helen Wallis: "Thematic Maps—a New Cartographic Language".

INSTITUTION OF ELECTRICAL ENGINEERS, LONDON GRADUATE AND STUDENT SECTION (at Savoy Place, London, WC2), at 6.30 p.m.—Mr J. Miley: "Control of a Large Power System" (Chairman's Inaugural Address).

## Tuesday, October 22

INSTITUTION OF ELECTRICAL ENGINEERS (at Savoy Place, London, WC2), at 5.30 p.m.—Dr W. F. R. Gosling: "An Optical Beam Rider".

INSTITUTION OF MECHANICAL ENGINEERS, AUTOMOBILE DIVISION (at 1 Birdcage Walk, Westminster, London, SW1), at 6 p.m.—Two papers by Mr Maurice Platt and Professor A. C. Stevens (Lanchester Centenary).

SOCIETY OF CHEMICAL INDUSTRY, PLASTICS AND POLYMER GROUP (at 14 Belgrave Square, London, SW1), at 6 p.m.—Dr D. Lim: "Polymerization of some Methacrylic and Acrylic Monomers by Alkali Metal Compounds".

UNIVERSITY OF LONDON, DEPARTMENT OF EXTRA MURAL STUDIES; and the LINNEAN SOCIETY OF LONDON (at the Linnean Society, Burlington House, Piccadilly, London, W1), at 6.30 p.m.—The Earl of Crambrook, CBE: "Exploration for Animals in the 19th and 20th Centuries". (Fourth of twelve lectures on "The Historical Background to Modern Zoology".)

INSTITUTION OF THE RUBBER INDUSTRY (at the Eccleston Hotel, Eccleston Square, London, SW1), at 7 p.m.—Mr M. Kaufman: "Training in the Rubber Industry".

## Wednesday, October 23

ROYAL INSTITUTION, HISTORY OF SCIENCE DISCUSSION GROUP (at 21 Albemarle Street, London, W1), at 1 p.m.—Miss A. K. O'Hara-May: "Early Studies of Quantification in Nutrition".\*

INSTITUTE OF NAVIGATION (at the Royal Geographical Society, 1 Kensington Gore, London, SW7), at 4.30 p.m.—Annual General Meeting followed by Professor A. Stratton: "The Science and Technology of Navigation" (Presidential Address).

INSTITUTION OF ELECTRICAL ENGINEERS (at Savoy Place, London, WC2), at 5.30 p.m.—Discussion meeting on "Electro-Optics" opened by Dr J. Bass and Dr K. F. Hulme.

INSTITUTION OF ELECTRICAL ENGINEERS (at Savoy Place, London, WC2) at 5.30 p.m.—Mr F. J. Lane, OBE: "Engineering Unlimited".

INSTITUTION OF ELECTRONIC AND RADIO ENGINEERS, EDUCATION GROUP (at 9 Bedford Square, London, WC1), at 6 p.m.—Mr Roy Cox: "Are Examinations Really Necessary?"

INSTITUTION OF MECHANICAL ENGINEERS (at 1 Birdcage Walk, Westminster, London, SW1), at 6 p.m.—Sir Arnold Lindley: "Becoming Wise after the Event" (Presidential Address).

SOCIETY OF ENVIRONMENTAL ENGINEERS, PACKAGING GROUP (in the Mechanical Engineering Department, Imperial College, London, SW7), at 6 p.m.—Mr C. F. Marshall: "Another Look at Fragility".

SOCIETY OF CHEMICAL INDUSTRY, FOOD ENGINEERING PANEL (at 14 Belgrave Square, London, SW1), at 6.15 p.m.—Mr C. Dodson and Mr A. Cunningham: "Uses of Plastics in Food Processing Plant".

## Thursday, October 24

INSTITUTION OF MECHANICAL ENGINEERS, MANUFACTURE AND MANAGEMENT GROUP (at 1 Birdcage Walk, Westminster, London, SW1)—All-day Discussion meeting on "The Utilization of Professional Engineering Manpower".

INSTITUTION OF ELECTRICAL ENGINEERS (at Savoy Place, London, WC2), at 2.30 p.m.—Colloquium on "Transmission-Line Properties of Interconnections and Their Measurement".

INSTITUTION OF ELECTRONIC AND RADIO ENGINEERS, JOINT IERE/LEE MEDICAL AND BIOLOGICAL ELECTRONICS GROUP (at 9 Bedford Square, London, WC1), at 2.30 p.m.—Colloquium on "Recent Advances in the Design of Biological Amplifiers".

INSTITUTION OF MECHANICAL ENGINEERS, NUCLEAR ENERGY GROUP (at 1 Birdcage Walk, Westminster, London, SW1), at 6 p.m.—Discussion meeting on "Power Station Control—is Automation the Preferred Solution?"

## Friday, October 25

ROYAL INSTITUTION, PHOTOCHEMISTRY DISCUSSION GROUP (at 21 Albemarle Street, London, W1), at 1 p.m.—Dr A. Kelly: "Some Model Systems for Photosynthesis".\*

SOCIETY OF CHEMICAL INDUSTRY, ROAD AND BUILDING MATERIALS GROUP (joint meeting with the Institution of Highway Engineers, at the Institution of Structural Engineers, Upper Belgrave Street, London, SW1), at 5.30 p.m.—Dr A. R. Lee: "Slag for Highways: Production, Properties and Uses".

ROYAL INSTITUTION (at 21 Albemarle Street, London, W1), at 9 p.m.—Surgeon Rear-Admiral Stanley Miles: "Human Factors in Underwater Research".

## Monday, October 28

INSTITUTION OF ELECTRICAL ENGINEERS (at Savoy Place, London, WC2), at 2.30 p.m.—Colloquium on "Solid State Displays".

INSTITUTION OF MECHANICAL ENGINEERS, RAILWAY ENGINEERING GROUP (at 1 Birdcage Walk, Westminster, London, SW1), at 6 p.m.—Discussion meeting on "Commissioning New Equipment".