# matters arising

## Waste and the Pacific

SIR,—The letter which appeared in *Nature* concerning the distribution of tar along latitude 35°N in the Pacific Ocean[1] raises the question of the cause of the pronounced peaks which occur.

One of the explanations advanced is that meanders in the Kuroshio current could be responsible for the distribution. If this were the case, the distribution would have peaks corresponding to the meander wavelengths, which are typically 200 km to 400 km (2° to 4° longitude). This is unlikely to be correct, since the three pronounced peaks are separated by distances of 2,000 km (20° longitude) and 1,300 km (13° longitude).

Another possible explanation of this distribution is that the intense Kuroshio current may generate a series of Rossby waves, which can propagate across the entire Pacific Basin[2].

In a numerical model recently developed by myself (to be published) a surface layer, 100 m deep and in an idealised basin, was subjected to a zonal wind stress typical of winter in the Northern hemisphere. The energy dissipation was parameterised to occur over the contintental shelves. The resulting steady circulation produced (Fig. 1) shows 'ripples' in the eastward flowing current between the subarctic gyre and the sub-tropical gyre (30°N to 55°N). The wavelengths in this particular example decrease from 1,300 km (13° longitude) in the western half of the basin to 600 km (6° longitude) in the east. The amplitude of meridional velocity at 35°N decreased from 8 cm $s^{-1}$ in the west to 4 cm $s^{-1}$ in the east.

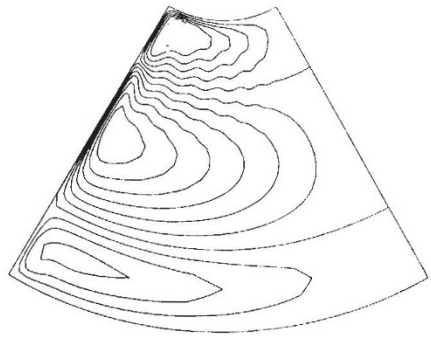

FIG. 1 The pattern of streamlines induced by a steady wind field in a hypothetical ocean basin, which extends from the equator to 60°N, and has a width of 60° longitude. The flow of the water is parallel to the streamlines and its intensity is proportional to the concentration of streamlines. The intense flow on the western edge of the basin is representative of the Kuroshio current in the North Pacific and the Gulf Stream in the North Atlantic.

I suggest, therefore, that the observed distribution of tar may be explained more satisfactorily in terms of the type of waves predicted by the model.

Yours faithfully,

N. C. WELLS

*Department of Geophysics, University of Reading, Reading RG6 2AO*

[1] Wong, C. S., Green, D. R., and Cretney, W. J., *Nature*, **247**, 30 (1974).
[2] Moore, D. W., *Deep Sea Research*, **10**, 735 (1963).

# obituary

## G. P. Kuiper

GERARD PETER KUIPER died suddenly on December 24, 1973, after a long and greatly distinguished career of ardent devotion to astronomy. He has left his mark by his achievements in observational and theoretical research and in developing new instruments, and in many other ways—as a director and founder of research institutes, as a writer and editor in the grand manner, as from the outset a prominent collaborator in the NASA lunar and planetary programmes which he called "the greatest scientific venture of history."

Kuiper was born on December 7, 1905 in the Netherlands. In 1933 he gained his doctorate in Leiden for a thesis on binary stars with the renowned Ejnar Hertzsprung as his adviser. He then went to work mainly on the same subject at Yerkes Observatory, where Otto Struve had assembled perhaps the most brilliant team of young astronomers in existence. After spending the year 1935–6 at Harvard, Kuiper returned to Yerkes as a staff-member and, apart from civilian scientific war services—he had become a United States citizen in 1937—he remained until 1960, twice serving as Director of the Yerkes and McDonald Observatories 1947–49, 1957–60. He then moved to the University of Arizona in Tucson, where he founded and directed the Lunar and Planetary Laboratory and its Catalina Observatory with an armoury of large telescopes for planetary work. These included the well-known 61-inch high resolution telescope specially adapted for observations in the near infrared, one of the many fields in which Kuiper was a pioneer. He relinquished some administrative responsibilities in 1973, but at the time of his death he was planning fresh developments of his scientific work. In the United States and abroad, Kuiper received numerous honours for his contributions to astronomy; the Royal Astronomical Society elected him an Associate in 1951.

As long ago as 1937, Kuiper's paper on Hertzsprung-Russell diagrams of stellar clusters pointed the way to much subsequent empirical work on stellar evolution. His pioneering work with Strömgren and Struve on models for close binary stars initiated what is still one of the most lively branches of stellar astrophysics. His classical papers of 1938 on the empirical mass-luminosity relation and of 1942 on "the nearest stars" remained for over a decade the main compendia of empirical stellar parameters.

Kuiper's dominating lifelong interest was, however, the solar system. He discovered two new satellites Miranda (Uranus) and Nereid (Neptune), the atmosphere on Saturn's satellite Titan, and the asteroid that bears his name. From 1960 onwards he produced (with

collaborators) four successive atlases of the Moon, based first on observations from Earth and then from space vehicles, and these played a vital role in choosing sites for Apollo landings. All this effort was inspired by the hope of ultimately elucidating the origin of the solar system.

With the astronomer Barbara M. Middlehurst, Kuiper edited the two famous series *The Solar System* (four of its five volumes are published), and *Stars and Stellar Systems* (seven of its nine volumes are published). Indeed, astronomers have seemed to be more excited when a new Middlehurst-Kuiper volume appeared than they were when quasars or pulsars were discovered.

# Announcements

## Appointments

The Council of the University of Bristol has appointed D. C. Smith, of the Department of Agricultural Science of the University of Oxford, to the Melville Wills Chair of Botany.

## Erratum

In the article "Fluctuations in oil flow before and after earthquakes" by E. Arieh and A. M. Merzer (*Nature*, **247**, 534; 1974) the former author is at the Seismological Laboratory, Geological Survey of Israel, Jerusalem and the latter at the Department of Environmental Sciences, University of Tel Aviv.

## International Meetings

April 15–19, **9th International Symposium on Remote Sensing of the Environment** (Extension Service, Conference Department, The University of Michigan, Ann Arbor, Michigan 48104)

April 16–17, **The Application of Chemical Engineering to the Treatment of Sewage and Industrial Liquid Effluents** (Dr D. Geldart, Postgraduate School of Studies in Chemical Engineering, University of Bradford, Yorkshire)

April 16–18, **Optical and Acoustical Microelectronics** (Jerome Fox, Polytechnic Institute of Brooklyn, MRI Symposium Committee, 333 Jay Street, Brooklyn, New York 11201)

April 16–18, **University of Dacca Physics Symposium** (Professor A. M. Harunar Rashid, Organising Secretary, Physics Department, University of Dacca, Dacca 2, Bangladesh)

April 17–19, **2nd Conference on Negative Ions** (The Meetings Officer, The Institute of Physics, 47 Belgrave Square, London SW1X 8QX)

April 18–19, **Annual Congress and Scientific Exhibition of the British Institute of Radiology** (The General Secretary, The British Institute of Radiology, 32, Welbeck Street, London W1M 7PG)

April 22–24, **1st International Conference of the Aslib Transport and Planning Group** (Mr C. C. Parker, The Library, University of Southhampton, Southhampton SO9 5NH, UK)

April 22–25, **Joint American Physical Society and Optical Society of America Meeting** (The American Institute of Physics, 335 East 45 Street, New York 10017)

April 22–26, **Biochemische Analytik 74** combined with **1st European Congress of Clinical Chemistry** (Secretary General, Dr Rosmarie Vogel, D-8000 Munchen 2, Nussbaumstrasse 20, West Germany)

April 22–26, **Conference on Anomalous Scattering** (S. C. Abrahams, (International Union of Crystallography), Bell Laboratories, Murray Hill, New Jersey 07974)

April 22–26, **The Engineer in Society** (EUROCON '74, c/o Klvl, 23 Prinsessegracht, The Hague, The Netherlands)

April 22–26, **European Conference on Electrotechnics** (Mr G. Gaikhorst, c/o FME, Nassaulaan 13, The Hague, The Netherlands)

April 22–May 3, **Exploitation of Seismograph Networks** (International Advanced Study Institute, Sandefjord, Norway)

April 24, **Easter Lecture for Young People: Instant Energy-Heat Release with a Bang** (L. F. Linnett, Lecture Secretary, The Institute of Fuel, St Bernards House, St Bernards Road, Tonbridge, Kent TN10 3NL)

April 24–25, **Conference on Rheology of Clays and Cement Pastes** (Dr G. H. Tattersall, Department of Building Science, University of Sheffield, Arts Tower, Sheffield S10 2TN)

April 28–May 2, **76th Annual Meeting and Exposition of the American Ceramic Society** (Dr Peter Hawkins, Program Chairman, California Portland Cement Company, Box 947, Colton California 92324)

April 30–May 2, **3rd International Cannibis Conference** (The Conference Secretary, Institute for the Study of Drug Dependence, Chandos House, 2, Queen Anne Street, London W1M OBR)

# Reports and Publications

*not included in the Monthly Books Supplement*

## Great Britain and Ireland

Council for Academic Freedom and Democracy. Annual Report 1972–1973. Pp. 16. (London: Council for Academic Freedom and Democracy, 1973.) [1511

Meteorological Office. Geophysical Memoirs No. 119: A Climatology of the Stratosphere Over North-West Europe. By R. A. Hamilton, B. D. Mason and G. C. Bridge. (Met.O.864a.) Pp. 37. (London: HMSO, 1973.) £2.10 net. [1611

Arthritis: a Vitamin Deficiency Disease. By Dr E. C. Barton-Wright. Pp. 32. (London: United Trade Press Ltd, 1973.) £1.25. [412

The Piltdown Man Hoax. (Palaeontology Leaflet No. 2.) Pp. 7. (London: British Museum (Natural History), 1973.) 7p. [412

Patterns of Growth. By Jerome S. Bruner. (Inaugural Lecture delivered before the University of Oxford on 25 May 1973.) Pp. 22. (Oxford: Clarendon Press, 1974.) 50p net. [612

The Medical Research Council of Ireland. Annual Report for the year ended December 31, 1972. Pp. 106. (Dublin: Medical Research Council of Ireland, 1973.) 25p. [612

British Antarctic Survey. Scientific Reports, No. 67: The Geology of Parts of the Bowman and Wilkins Coasts, Antarctic Peninsula. By A. G. Fraser and P. H. Grimley. Pp. 59+8 plates. (London: British Antarctic Survey, 1972.) £2.80 net. [712

## Other Countries

An Annotated Bibliography, 1797–1969. By Warren Addicott. Pp. iii+201. $1.50. Bulletin 1374: Placer Deposits of Alaska. By Edward H. Cobb. Pp. vi+231+plate 1. $3.10. Water-Supply Paper 2019-B: Generalization of Stream-Temperature Data in Washington. By M. R. Collings. Pp. iv+45. 30 cents. Water-Supply Paper 2092: Quality of Surface Waters of the United States, 1968. Part 2: South Atlantic Slope and Eastern Gulf of Mexico Basins. Pp. x+373. $2.35. Professional Paper 526-C: Cretaceous and Early Tertiary Depositional and Tectonic History of the Livingstone Area, Southwestern Montana. By Albert E. Roberts. Pp. iv+120+plates 1–3. Professional Paper 306-E: Geology and Paleontology of Canal Zone and Adjoining Parts of Panama. Description of Tertiary Mollusks (Additions to Gastropods, Scaphopods, Pekecypods—Nuculidae to Malleidae). By W. P. Woodring. Pp. iii+453–539+plates 67–82. $1.75. (Washington, DC: Government Printing Office, 1973.) [3010

Animal Models of Human Disease: a Handbook. Pp. 98. (Reprints.) (Washington, DC: The Registry of Comparative Pathology, Armed Forces Institute of Pathology, 1973.) [3110

Smithsonian Contributions to Zoology. No. 120: A Systematic Monograph of New World Ethmiid Moths (Lepidoptera: Gelechioidea). By Jerry A. Powell. Pp. iv+302. (Washington, DC: Smithsonian Institution Press, 1973. For sale by US Government Printing Office.) $3.85. [3110

Nederlandse Vereniging voor Weer- en Sterrenkunde. Observations of Variable Stars, January–June 1973. (Report No. 24.) Pp. 7. (Groningen, Netherlands: Kapteyn Astronomical Laboratory, 1973.) [3110

Smithsonian Contributions to the Earth Sciences, No. 10: Mineralogy, Mineral-Chemistry, and Composition of the Murchison (C2) Meteorite. By Louis H. Fuchs, Edward Olsen and Kenneth J. Jensen. Pp. iii+39. (Washington, DC: Smithsonian Institution Press, 1973. For sale by US Government Printing Office, 1973.) 75 cents. [611

Ecology and Resource Development in Southeast Asia: a Report to the Ford Foundation. By Gordon Conway and Jeff Romm. Pp. 82. (New York: Ford Foundation, 320 East 43 Street, 1973.) [711

Smithsonian Contributions to Zoology. No. 150: A Review of the Genus *Cancellus* (Crustacea: Diogenidae) with the Description of a New Species from the Caribbean Sea. By Barbara Shuler Mayo. Pp. iii+63. $1.50. No. 151: Revision of Corophiidae and Related Families (Amphipoda). By J. Laurens Barnard. Pp. iv+27. 55 cents. (Washington, DC: Smithsonian Institution Press, 1973. For sale by US Government Printing Office.) [711

United States Department of the Interior: Geological Survey. Bulletin 1351: Geology and Description of the Thorium-Bearing Veins, Lemhi Pass Quadrangle, Idaho and Montana. By Mortimer H. Staatz. Pp. iv+94+plates 1–4. Professional Paper 716-E: Distribution, Thickness and Lithology of Paleocene Rocks in Pakistan. By Charles R. Meissner, Jr., and Habib-ur Rahman. Pp. v+6+plates 1–4. $1.25. (Washington, DC: Government Printing Office, 1972 and 1973.) [711

The Coconut Industry Board, Jamaica, West Indies. 12th Report of the Research Department, July 1971–June 1972. Pp. 65. (Kingston: Coconut Industry Board, 1973.) J$2; 90p; US$2.20. [811

Bulletin of the American Museum of Natural History. Vol. 152, Article 2: Revision of Ground Beetles of American Genus *Cychrus* and Four Subgenera of Genus *Scaphinotus* (Coleoptera, Carabidae). By Tatiana Gidaspow. Pp. 51–102. (New York: American Museum of Natural History, 1973.) $23.00. [1311