RÉSUMÉ

Well-timed words

WOULD-BE linguists should pay as much attention to the rhythms and timing of words in foreign tongues as to pronunciation of individual sounds. That was the conclusion of K. Tajima and R. Port (Indiana Univ.) and J. Dalby (Communication Disorders Technology, Indiana) at a meeting of the American Acoustical Society earlier this month. They recorded the same short English phrases spoken by a native English speaker and by a native Chinese speaker, digitized the waveforms, and did a little fancy cutting and pasting to expand or contract parts of the Chinese speaker's phrase so that the timing matched that of the English speaker. Listeners presented with the unadulterated phrase and asked to say which of two similar-sounding options they had heard (say, "equal size" or "you're concise") identified the correct meaning in only 55 per cent of cases, whereas for the re-timed phrases the success rate rose to about 80 per cent.

Pack deaths

SMALL populations of endangered species may be driven to extinction by the very researchers whose concern it is to keep the animals alive. This dark possibility emerges from further evidence that the packs of wild dogs (*Lycaon pictus*) in the Serengeti and Masai Mara that became extinct between 1965 and 1991 were the same ones studied by researchers. R. Burrows *et al.* (*Proc. R. Soc. Lond.* B**256**, 281–292; 1994) re-evaluate their own and others' data, and alternative hypotheses, and conclude that the most likely explanation for the demise of the study packs is that intervention-induced stress made the animals more vulnerable to rabies. The message is that the effects of field techniques such as trapping, darting, tagging, radio-collaring, tissue sampling and vaccination should not be ignored as factors influencing the fate of species under threat.

Orbital link

HYDROGEN bonds between oxygen and hydrogen are common throughout organic chemistry; fluorine and nitrogen, two other highly electronegative atoms, also form such bonds readily. But M. Iwaoka and S. Tomoda (*J. Am. chem. Soc.* **116**, 4463–4464; 1994) believe they have now found a compound held in shape by hydrogen bonds to selenium. NMR and single-crystal X-ray data on diselenocin, which contains two benzyl rings linked by a larger, floppier ring of two selenium and two CH_2 units, lead them to conclude that each selenium attracts one of the opposing hydrogen atoms. This is unexpected, as selenium is not highly electronegative, nor is the C–H bond highly polar. The authors suggest that it arises from orbital interaction between the selenium lone pair and C–H.

trially by Enichem in Italy to oxidize phenol to catechol and hydroquinone, and to make cyclohexanone oxime from cyclohexanone and ammonia[6]. Many homogeneous oxidation systems, using hydrogen peroxide and catalysed by transition metal ions and complexes, are known in the laboratory, but as yet there are no published examples of commercial applications. □

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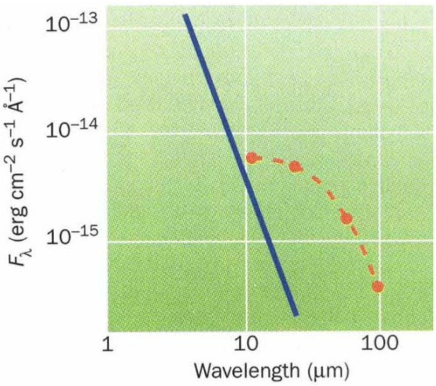
PLANETARY SCIENCE

Footprints in the dust

Charles M. Telesco

NEW infrared images of a disk of particles circling the star β Pictoris are the testing ground for a powerful indirect means of detecting other planetary systems, as Lagage and Pantin show on page 628 of this issue[1]. The images reveal that the inner region of the disk is clear of dust, possibly swept away by a planet.

The only direct way to detect an extrasolar planet is to image the star and look for the spot of planetary light nearby. The task is extraordinarily difficult because the planets can be lost in the glare of the much brighter star. The reflected solar radiation from Jupiter, the largest planet in our Solar System, is a billion times fainter than the Sun at visual wavelengths, and viewed from a modest distance of 5 parsecs (16 light years), Jupiter would be separated by less than an arcsec from the Sun. This approach, so far unsuccessful, will benefit greatly from the advent of new technologies and bigger telescopes[2].



The infrared excess emission (points) detected from the star β Pictoris by IRAS, compared with the normal emission from the star (solid line). Near 10 μm, the total emission from the inner disk, imaged by Lagage and Pantin[1], is about equal to that from the star itself. The star's visible light peaks near 0.5 μm at a flux (F_λ) of log $F_\lambda \approx -10$.

Indirect search techniques take advantage of the fact that planets gravitationally disturb their environments. For instance, a planet and its star orbit their centre of gravity, causing a periodic wobble of the star's position on the sky and along the line of sight, the latter motion detectable by the Doppler shift of spectral absorption lines from the star's photosphere. Studies of stellar line-of-sight motions provide strong evidence for the existence of several planetary systems beyond our own[3–5]. The most spectacular of these is the pulsar B1257+12, for which the periodicity of the radio pulses from the neutron star seems to be modified by at least two planets with masses about three times that of the Earth, tugging on the star[5,6].

But a planet's gravitational pull can have subtler influences in a stellar system. Besides the Sun, planets and comets, our Solar System contains solid particles with sizes ranging from many kilometres (asteroids) to nanometres (dust). Our Solar System's zodiacal light is actually sunlight scattered from dust particles distributed throughout the orbital plane of the planets. The particles reflect only part of the incident sunlight, absorbing the rest which is then emitted at infrared wavelengths. The Infrared Astronomical Satellite (IRAS) mission in 1983 showed that the gravitational influence of the planets has caused the zodiacal dust to be distributed in distinct bands[7]. Can we detect the visible or infrared radiation from such particles in other star systems? If so, perhaps a planet there would leave its gravitational footprints in the dust just as it has in our Solar System. The infrared images of β Pic made by Lagage and Pantin indicate that this elegant indirect approach to detecting planets may indeed be feasible.

Using IRAS, astronomers were amazed to discover that the main-sequence star Vega has ten times more emission at wavelengths of 60 and 100 μm than expected from a reasonable extrapolation of the visual flux[8]. More than a hundred such stars have now been found, β Pic being the most remarkable example. Visual images of β Pic show what is surely an edge-on disk extending out to more than 1,000 astronomical units from the star[9] (1 AU is the distance from Earth to Sun). As in the Solar System's zodiacal disk, the extended emission around stars in this class results from both scattering and absorption of starlight by disk particles.

The disk of β Pic appears unusually bright and large (its angular size is more than an arcminute), and it is thus a special