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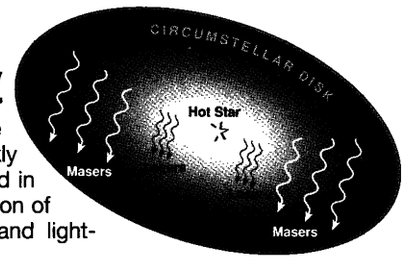

New stars, old lives, and fast delivery

How to detect and identify laser emissions in space (right), human longevity, and delivering reports quickly to the government are among the topics discussed in this weeks' letters. Other subjects include expression of major histocompatibility complex class I genes and light-emitting electrochemical cells.

Space Laser

In the News article "First light from a space laser" (8 Sept., p. 1336), James Glanz describes the discovery of possible laser emission at 169 micrometers (μm) from the disk surrounding a young star in Cygnus (MWC349). The reader might be left with the misimpression that this is the first laser discovered in space. Laser emission in the familiar 10-μm bands of CO_2 had earlier been identified in the mesospheres and thermospheres of Mars (*1*) and Venus (*2*) and are reviewed in (*3*). The same lasing bands are used in commercial CO_2 lasers for applications ranging from medicine to metallurgy.

The CO_2 nonthermal emission on Mars and Venus was first observed (*4*) by students of Charles Townes and was identified as a "natural laser" after the discovery of significant gain in the transitions (*1*, *2*). The population inversion is pumped by sunlight and thus is found only in the daylit hemisphere. The lines are about 100 million times brighter than if the state populations were in thermodynamic equilibrium, but only a small portion of the excess emission represents stimulated emission. The amplification is about 10% along the tangent path passing through altitudes of maximum gain (*1*, *2*), and this has been confirmed by several independent groups (*5*).

The amplification is comparable to single-pass gains in some CO_2 lasers on Earth, and the laser could be made to oscillate if mirrors were placed in appropriate orbits about the planet. The resulting light would be highly directional and could be detected with high bandwidth over interstellar distances with the use of currently available detection techniques (*6*). The technology of realizing planetary scale lasers is beyond our current capability, but future prospects were explored by Brent Sherwood (*7*). Meanwhile, the emission lines have proved useful for probing temperatures and winds on Mars (*3*) and Venus (*8*).

The laser detected in the star MWC349 by Vladimir Strelnitski and his team—in the H15α line at 169 μm—was preceded by the detection of maser emissions in that object in the H26α line at 850 μm and in H21α at 450 μm by ground-based observers (*9*). Distinguishing a maser in the H21α line from a laser in H15α is subject to some semantic interpretation. The latest discovery in MWC349 is interesting and suggests new directions for probing the disks around young stars. Conditions in them must be evaluated more completely before the circumstellar maser emissions, and the nebular processes revealed by them, can be regarded as completely understood.

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Reporting to the Government

The article "NRC pledges faster delivery on reports to government" by Andrew Lawler (News & Comment, 6 Oct., p. 22) states