TECHNOLOGY

Wrist broadcasts

The Dick Tracy wrist radio may not be far off. James C. Gaddie and Russell T. Wolfram of SRI International, Inc., in Menlo Park, Calif., use the human arm as an antenna for receiving or broadcasting very-high frequency radio messages. Designed for the Helen Keller Center for the Deaf Blind in New York, the wrist unit will transmit Morse code messages to and from the wearer over a radius of about one mile, Wolfram told SCIENCE NEWS.

Two strips of copper foil, 5 inches long and a half inch wide, are adhered $^{7}/_{16}$ of an inch apart to the underside of a wrist band made from electrically insulating material. (Thin insulating strips also protect the foil; the foil need not contact skin to pick up or transmit signals from the arm.) A receiver, transmitter or combination unit connects to the wristlet via wires routed through the insulation to the foil.

Future adaptations of the NASA-funded work may include Dick Tracy-style two-way police communicators or portable, personal units to relay data long distance via satellites.

Plasma carburizing saves

Steel is not a particularly hard metal. But case hardening — diffusing carbon atoms into the casing, or skin — of steel parts makes them two or three times harder. General Motors, which case hardens, or carburizes, millions of auto parts daily has sought to improve on the lengthy and gas-intensive metallurgical process. And one of its materials physicists, William Grube of the GM Research Laboratories in Warren, Mich., has developed a promising alternative. Called plasma carburizing, it reduces not only the time and natural gas needed to harden steel but also the cost.

Steel parts are usually hardened by "baking" them in a mixed-gas atmosphere heated to 900°C for eight or more hours. Chemical reactions in the surface cause the steel to absorb carbon from the gas. But plasma carburizing takes place in a 1,040°C low-pressure (near vacuum) methane atmosphere. A positive electrode is placed above the component to be hardened and the component used as a cathode. As an electric-potential difference is applied, a plasma envelopes the component. Energetic electrons in the plasma break down the methane. It takes only 10 minutes for the freed carbon atoms to enter the steel, then the oven is turned down to 1,000°C and the steel baked 30 minutes more, or until the carbon has diffused deep enough — typically one or two millimeters.

Unlike conventional carburizing ovens which use gas for heating, the plasma oven is electric; gas is used only as a source of carbon. And although electricity costs five or six times more than gas, the shortened baking cycle leads to cost savings of 50 to 60 percent. GM is currently evaluating auto parts hardened with the Grube recipe.

Three-dimensional photography

Imagine a pocket-sized camera that takes three-dimensional color prints and slides as easily as a 35-millimeter camera. Jerry Nims and Allen Lo of Nimslo Co. in Atlanta claim they've developed just that, according to the September INDUSTRIAL RESEARCH /DEVELOPMENT. Four lenses mounted side by side expose separate negatives. In printing, an enlarger optically slices each negative into strips thinner than a hair, and then combines them into a single picture. When viewed through a plastic coating with hair-thin corrugations running parallel to the strips in the print, the eye sees a 3-D image in natural focus (the corrugations are actually tiny lenses). Nims said prints should cost less than "Polaroid" prints. A British Nimslo affiliate plans to market "Computrak 3-D" later this year in Britain.

ASTRONOMY

Solar flares and stellar flares

Solar flares are possibly the most dramatic manifestation of solar physics. A bright burst of matter comes up from the surface of the sun. The light they emit is often accompanied by intense radio bursts and X-ray outbursts of various energies.

Astronomers have wanted to know whether other stars have similar flares, and for that purpose correlated observations of Proxima Centauri were mounted using optical telescopes at the South African Astronomical Observatory and Cerro-Tololo Inter-American Observatory, radio telescopes at Parkes, Australia, and Johannesburg and the SAS-3 X-ray satellite. In the Oct. 1 ASTROPHYSICAL JOURNAL LETTERS Bernhard M. Haisch and Jeffrey L. Linsky of the Joint Institute for Laboratory Astrophysics, O. B. Slee of the Australian CSIRO, David R. Hearn of Massachusetts Institute of Technology, Alistair R. Walker of the South African Astronomical Observatory, A. Eric Rydgren of CTIO and G. D. Nicolson of the South African CSIR report that the three days of observation recorded 30 optical flares and 12 possible radio bursts (no X-ray bursts), but none of the correlation characteristic of solar flares.

Strangely rotating X-ray source

The usual astrophysical model of a pulsating X-ray source involves a binary system, two stellar objects orbiting around each other. One of these is a more or less ordinary star; the other a dark object, such as a neutron star or perhaps a black hole. Matter from the ordinary star flows onto the dark object and, as it approaches the surface of the dark object, forms an "accretion disk" around it. Heating in this accretion disk generates the X-rays. Eclipsing of the disk causes the pulsations.

In the Sept. 15 ASTROPHYSICAL JOURNAL LETTERS T. Matilsky and J. La Sala of Rutgers University and J. Jessen of Massachusetts Institute of Technology report a datum about the X-ray source 4U 1700-37 that does not accord very well with that model. The datum is a fluctuation in the X-ray amplitude that repeats in a period of 97 minutes. This is quite distinct from the 3.5-day period of the *pulsations,* which is associated with the orbit of the binary system.

The 97-minute fluctuation is attributed to the rotation of the X-ray source itself; that is, the dark object and its attendant accretion disk. And that is a problem, because the numbers calculable from the model lead to a spin-down time (to no rotation) of a year or less for such a slow rotation. The source has been under observation for longer than that.

There are three suggestions for getting out of the dilemma: The 97-minute fluctuation is not connected to the rotation of the dark object. The dark object may be a white dwarf, which calls for a different calculation. Or the dark object may be making X-rays without an accretion disk.

37 new Herbig-Haro objects

Herbig-Haro objects are another of the many curious classes of objects in the sky. Small, nebular and reddish, they have spectra consisting of emission lines of various elements with a very weak continuous spectrum in the background. Efforts to explain what they are have not adequately fit the data, but some astronomers have suggested that Herbig-Haro objects may be very early phases of stellar evolution.

A. L. Gyulbudaghian of the Byurakan Astrophysical Observatory in Armenia and Yu. I. Glushkov and E. K. Denisyuk of the Astrophysical Institute of the Kazakh SSR Academy of Sciences searched the Palomar Sky Survey for uncatalogued H-H objects and discovered 37, the locations of which they publish in the Sept. 15 ASTROPHYSICAL JOURNAL LETTERS.