

physical sciences notes

COMPUTER PROGRAMMING

Method for synthesizing Chinese characters

Research aimed at encoding two-dimensional information for use by digital computers has led to the development of a grammar and lexicon of components for writing Chinese characters. This, or a similar method, could lead to reading of Chinese texts by a computer.

The Chinese written language is in the form of word symbols involving thousands of characters. Scientists at the National Bureau of Standards have devised a grammar for placing their components in all allowable combinations.

They have accomplished this by developing a formal grammar for a Chinese equivalent to the linear lines of characters used in most of the world's written languages. The picture syntax, as they call it, involves three kinds of possible combinations—vertical, horizontal and surrounding—that often have to be dealt with at the same time.

The scheme devised by B. Kirk Rankin III and his co-workers at the National Bureau of Standards can also be used with other two-dimensional information, including roadmaps, drawings and chemical configurations.

CRYOGENICS

Phosphorus found superconducting

The element phosphorus has been found to become superconducting near 4.7 degrees Kelvin at pressures exceeding 100 kilobars, one bar being atmospheric pressure at sea level.

The discovery constitutes one of the four missing links in the proof that superconductivity is normal behavior for every truly metallic element in the class containing unfilled electrons in the *s* or *p* shells. The three remaining ones are arsenic, sulfur and iodine.

Dr. Bernd T. Matthias and Jorg Wittig of the University of California, San Diego, at La Jolla, report details of their experiment in the May 31 *SCIENCE*. They cooled pure phosphorus samples under constant load to detect the onset of superconductivity.

MATHEMATICAL ANALYSIS

Diffused resistors

Diffused silicon resistors are used extensively in integrated circuits, although little theoretical information concerning their electrical properties is available.

This lack has been remedied by David P. Kennedy and Philip C. Murley of International Business Machines' laboratory in East Fishkill, N.Y., who have made a detailed mathematical analysis of how an electric current behaves in a diffused semiconductor resistor.

They find that current crowding in this microelectronic device is far greater than had previously been suspected, an important fact for designers of future resistor units.

Included in their mathematical analysis of the two-dimensional properties of diffused resistors in silicon is the effect of impurity atom scattering and of transport velocity upon the mobility of holes and electrons.

The Kennedy-Murley study is based upon solutions

of Poisson's equation for a mathematical model that approximates the resistor, requiring about 20 million calculations, possible only by using a computer.

SOLAR SYSTEM ASTRONOMY

Radar radius of Venus determined

The radius of Venus has been determined from radar data taken at Jet Propulsion Laboratory's Goldstone facility in the California desert and, independently, from radar measurements with Lincoln Laboratory's Millstone Hill radar in Westford, Mass.

The radar determinations from earth are in serious disagreement with the combined observations from the Russian's Venera 4 and the U.S. Mariner V space probes, although in very good agreement with each other. They are reported in the May 31 *SCIENCE* in two reports by 12 scientists from JPL and Lincoln, Cornell and MIT.

Earth-based values are 6,050 kilometers with an error plus or minus five kilometers from Millstone and 6,053.7 plus or minus 2.2 kilometers from Goldstone, with no observations being used in common.

The Venus radius deduced from the two space probes—6,085 plus or minus 10 kilometers—is incompatible with the radar value. One explanation is that the altitude of Venera 4 was underestimated by about 35 kilometers.

HYDROLOGY

Nuclear explosions for water needs

To help meet Arizona's increasing need for water, the Atomic Energy Commission and the Department of Interior are making a joint study of the possible use of nuclear explosions.

The chimneys of broken rock formed by underground nuclear blasts might be used to channel water to depleted reservoirs. Also of interest is the possibility of using ground explosions to construct dams.

Whether an actual experiment is carried out will depend on determination that the detonation would not involve hazards to the public.

GEOPHYSICS

A physical model for Old Faithful

The recent confirmation of a prediction relating the duration of Old Faithful's eruptions to the time interval between eruptions has led Dr. Fred Geis Jr. of Harvard University to suggest a physical model of the geyser's internal cavity.

He proposes that during the quiet portion of a long interval between eruptions the lower part of the U-shaped cavity slowly fills and comes to a boil. An eruption takes place when the U portion of the cavity is sufficiently full to splash a quantity of water over into the dry, back half of the cavity.

This water then flash boils to steam, forcing the water out of the U section. The extent of the eruption, Dr. Geis reports in the May 31 *SCIENCE*, depends on the quantity of water splashed into the back half.

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