

physical sciences notes

MATHEMATICS

Fundamental Theory for Computing Speed

Since computers came into widespread use following World War II, designers have been able to build arithmetic units that compute in fewer and fewer steps. However, it was never clear how far these reductions could go for a particular type of basic circuit before it would be impossible to reduce the computational sequence further.

Now, Shmuel Winograd of IBM has devised a general formula for the shortest sequence of basic circuits through which numbers must pass in a computer for addition, multiplication or comparison of numbers. He has found only three determining factors.

Two of them are common characteristics of any computational circuit: the number of different signals that can be sent over a line between any two basic circuits, and the number of input leads to a circuit. The third factor reflects the largest number that can be represented in the arithmetic unit.

As an example, Mr. Winograd's equations, applied to a computer adder built with conventional binary circuits containing three input leads each and operating at 10-billionths of a second, show that it cannot add two 48-digit binary numbers in less than 50-billionths of a second, no matter how clever the design.

EDUCATION

Project Physics: Final Test

As Project Physics (SN:1/7) enters the fourth and last year of development and testing of its instructional materials—designed to appeal to students varying from the science-shy to the science-oriented—more than 6,000 students in widely different types of trial schools are helping to evaluate their effectiveness.

Early results of this evaluation indicate that the teaching consultants who joined the Cambridge staff for a year to work on revisions of the texts, laboratory and experiment guides have made valuable criticisms and suggestions. The materials are now scheduled for release in final form in 1969.

Meanwhile, feedback comments from students and teachers are being incorporated into the final revision now underway.

HOROLOGY

Greenwich Mean Time Ticking Out

Greenwich Mean Time will tick out at midnight on Feb. 17 when Britain adopts European time by advancing clocks one hour, putting the country, in effect, on year-round daylight saving time.

The old Greenwich Observatory near London, however, will continue to serve as the world's official marker for the prime meridian—zero degrees, zero minutes and zero seconds. The Observatory was established by a decree of King Charles II in 1675.

The site has served as England's prime meridian since 1800 and the world's since 1884.

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SOLAR ASTRONOMY

Detecting Solar Bursts

The early stages of the solar bursts that periodically interfere with radio transmission on the earth have been mapped by radio astronomers at the Pennsylvania State University.

By tuning a radiotelescope to four different frequency bands, the researchers followed the course of a dense blob of ultrahigh temperature plasma as it moved away from the sun's photosphere to a point farther out in the solar atmosphere. There such blobs erupt with as much energy as the sun radiates as a whole, according to Dr. John P. Hagen, head of the University's astronomy department.

The frequencies used ranged from 328 megacycles per second up 10,700, with the high frequencies recording what was occurring close to the sun's surface and the low frequencies detecting the material at a later stage close to eruption. Most previous observations, Dr. Hagen says, were limited to the eruption itself.

ASTRONOMY

Occultation of Antares

The thin waning crescent moon will pass in front of the bright star Antares for observers in the northeastern United States starting about 4:30 a.m. on Jan. 25. The disappearance should be easy to see with binoculars, weather permitting. The reappearance of the star from the darkened part of the moon is likely to be visible without optical aid for those with good eyesight.

The occultation will end about an hour after the disappearance, exact times being spelled out precisely in the January issue of SKY AND TELESCOPE, published in Cambridge, Mass. Reddish Antares has a fifth magnitude companion that will reappear about five seconds before the bright primary emerges.

ASTRONOMY

Third Largest U.S. Planetarium

The third largest planetarium in the United States is now in operation in Atlanta. It portrays the sky with a Carl Zeiss projector as it can be seen from any point on earth and from points in space.

A daily event can be shown 120 to 480 times as fast as it occurs in nature, and celestial movement during an entire year can be presented in 10 seconds. The 25,800-year precessional revolution of the North Pole, or of any fixed star system, which results from the slow gyroscopic wobble of the earth, can be compressed into four minutes.

The planetarium is part of the Fernbank Science Center, an educational complex for students and adults that also includes a 36-inch reflector telescope and 20 acres of forest area.