Up and Down the Street

S.L. Produces 'Micro-T

By Robert H. Woody
Tribune Business Editor

In the plastic tray, they appear as small golden flecks.

Under a 60-power microscope, they look like some sort of micro-organism with delicately scribed lines on their black shells from which protrude a dozen of stubby golden legs.

Mr. Woody

But these are not the product of nature. They are man-made by an ingenious metal oxide silicon technology.

They are transistors. And they are being built to function as part of the sensory nervous system for spacecraft.

The micro-oxide-silicon technology is the work of the Salt Lake plant of General Instruments Corp., of Newark, N.J.

It is headed by Dr. Leland J. Seely, who took his doctorate in physics from the University of Utah in 1962.

It was Dr. Seely and colleague Dr. Frank Wanless, also from the University of Utah, who broached General Instruments with potentialties of so-called MOS technology three years ago.

Their persuasion, and a substantial assist from Utah's Industrial Promotion Board, brought General Instruments to Salt Lake City a year and a half ago on a "tentative" basis.

They opened with a staff of 12 in a former pharmaceutical factory and warehouse just off State Street at 2435 South.

They now have an employe force of 56—heavily weighted with brainpower. Staffers include three Ph.Ds and 13 master's-degree holders.

The continuous miniaturization of electronic components is now an old story in the age of the computer.

In some cases, miniaturization has been the handiwork of skilled craftsmen working under large magnifying glasses or microscopes.

In this case of micro-miniaturization, manual work is entirely gone. The transistor is the result of a process in which photographic patterns become the basis of a sequence of chemical and thermal etching and veneering steps.

Cut Into Plastic Sheets

The patterns which form the basis of the complex circuitry are cut into plastic sheets about the size of a desk top. These patterns are reduced photographically to a size no larger than the head of a pin.

Here, it is refreshing to know that creative improvisation does not require a large expenditure of money. G.I. staffers built the reduction camera using a 135-mm lens borrowed from one of their colleague's cameras.

(He is due to get his lens back when a more precise camera is installed in a couple of weeks.)

The circuitry is massed reproduced by photographic process in checkerboard fashion on a thin silicon wafer about the diameter of an Alka-Seltzer tablet.

By treatment, the photographed image becomes acid resistant. The non-resistant parts are then etched out by acid to become channels for conductive aluminum which is applied as vaporized inlay.

These and like sequential steps build a complex logic device—no bgger than the head of a pin.

Dr. Seely notes, for example, that a desk-top-size pattern containing 500 circuits can be duplicated 400 times on a single 1½-inch diameter wafer.

The micronization of components is vital to space missions. Reason: The lighter the gadgetry, the more information and operational devices that can be put into a single package.

Job for NASA

General Instrument's MOS work is part of a job it is doing for the National Aeronautics and Space Administration.

Basically, a space vehicle must be nearly akin to a human organism in being able to interpret its environment and its own functioning.

This includes temperature response, pressure sensing, measuring light intensity, responding to meteoric impact and a host of other stimuli, and the transistors become a part of translating information into digital values.

How does it work?

Digital values are expressed in terms of sequinces of ones and zero.Any parent who has agonized through an exposure to the "new math" at a PTA meeting has a vague idea of what they mean.

Far More Precise

Whatever, the digital values are far more precise a measure of response than analog values which are expressions of magnitude.

If human experience can be taken as measure, the human thinks—as he has been trained to—in terms of magnitude. His old math, based on value of 10, has contributed to this system of response.

He kicks his toe and the logic system tells him rapidly that it's the left big toe.

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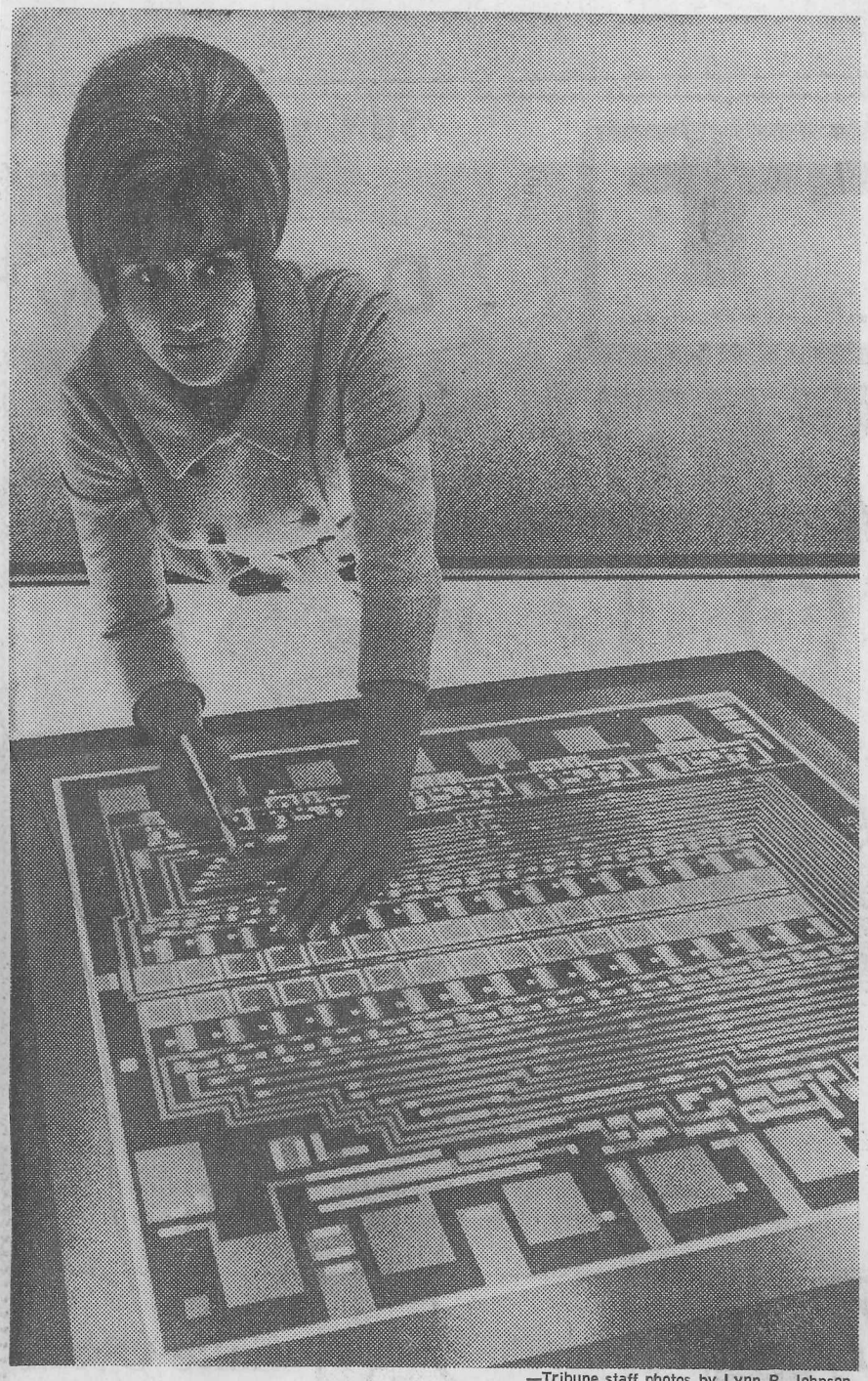

—Tribune staff photos by Lynn R. Johnson

This complex film transparency, being examined by Geri Bishop, is photographically reduced as pattern for etching circuits in wafer.

Mrs. Roland Williams holds wafer upon which about 400 micro-transistors have been transferred. The components will be cut from wafer.

Marts Closed Labor Day

NEW YORK (AP) — All U.S. securities exchanges, commodity and livestock markets will be closed Monday, Labor Day. The Toronto and Montreal securities exchanges and the Winnipeg grain market will be closed for the Canadian observance. The London Stock Exchange will be closed for th annual summer bank holiday.

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He kicks his toe and the logic system tells him rapidly that it's the left big toe.

But in measuring how bad the hurt, he can only say "Just a little bit" or "A heck of a lot!"

In space application, a temperature change would be perceived by the vehicle as an analog or magnitude value. The transmission of analog values are subject to error. The transistors are part of a system to recast the values as digital expressions — far less subject to error.

A human equipped with digital responses would possibly give his brain a precise value of the hurt inflicted on his toe.

General Instruments' transistors also are being steered toward other uses. One of them is a so-called "Security Communications System."

Under this system voice-radio communications are translated from among voltages to digital information.

The digital information is scrambled to avoid interpretation by an unwanted interceptor. The authorized receiver gets the digital information and puts it back in proper order which is energized as sound waves almost precisely akin to that of the voice of the sender. All this is accomplished within a fraction of a second.

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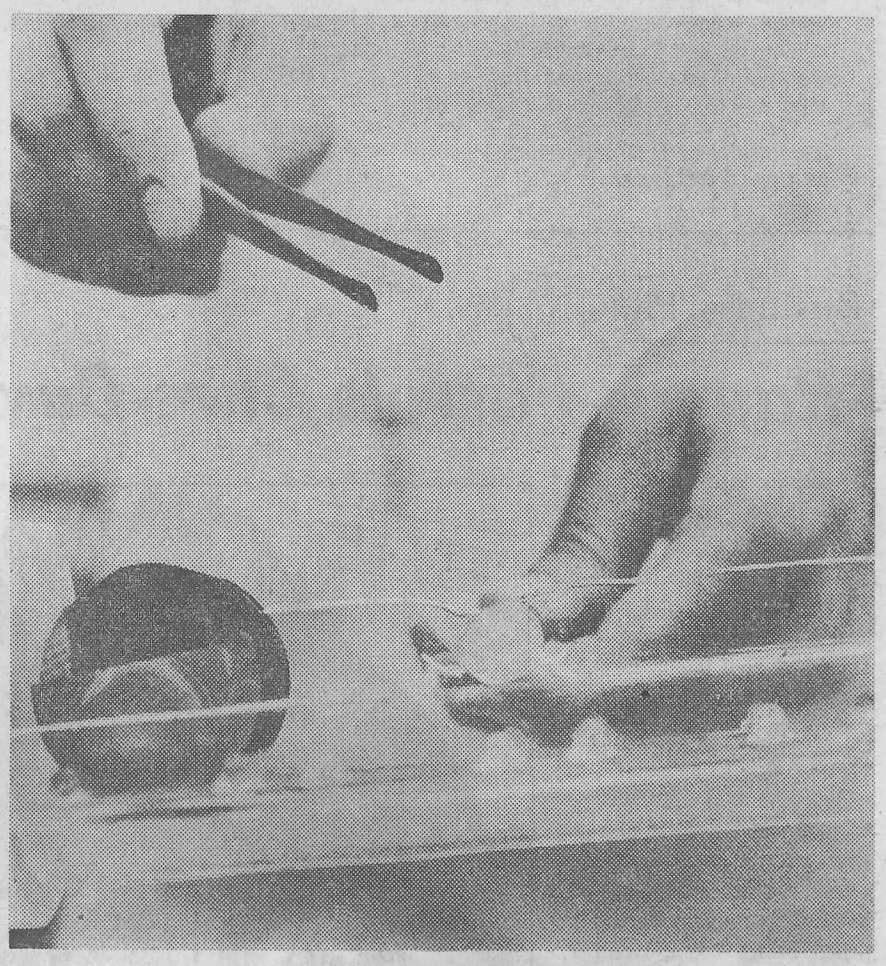

Heat treatment is among steps in which tiny transistors are chemically constructed on face of silicon wafer at Salt Lake plant.

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U.S. Food Plan Also Aiding Science

WASHINGTON (AP) — More than humanitarian needs are being served by the United States through its Food-for-Freedom program, which has helped distribute more than $17 billion in American farm products to needy countries since 1954.

The intellectual and scientific quests of mankind also have shared in the vast aid program. Last year's projects, financed by foreign currencies collected as payments for the U.S. food, included:

—A balloon flight to study gamma radiation of unknown origin in outer space.

—A study of the "biological interchange" between the Indian Ocean and the Mediterranian through the Suez Canal.

These are projects sponsored by the Smithsonian Institution and paid for by funds accumulated in various countries under Food-for-Freedom agreements.

The projects are listed in a White House report describing Food for Freedom operations in 1967.

Total U.S. farm exports have been more than $6 billion a year recently, with more than $1 billion credited to the aid program.

aughter bulls mostly lightweight medium

ndard to low good veal 50-27.75 good to choice

s: Choice, high-yielding fed ent; good to low choice standard to good 22.70-24.50.

eral lots choice 500-620 lb 24.00-24.80; other choice 500-700 lb 22.60-24.20; good 21.70-23.20; standard 19.00-21.75; few good to choice 3- to 5-day-old dairy-bred calves 27.00-41.00 head.

Hogs—150; compared 180 last week and 160 last year. Barrows and gilts 25-50 higher.

Lot U.S. 1-3 218 lb 21.20; 2-4 mostly 3s, 190-245 lb 20.20-20.90.

Slaughter cows: Confir Idaho, utility and commerci lb 18.50-18.75; mostly slau f.o.b. feedlots, 4-5 pct. shr mediate delivery; some basis included 5-25 freight.

Feeder cattle: confirr Nevada 4,800, Idaho 9,900, in Nevada, Sept. Oct. de choice 475-525 lb thin ye