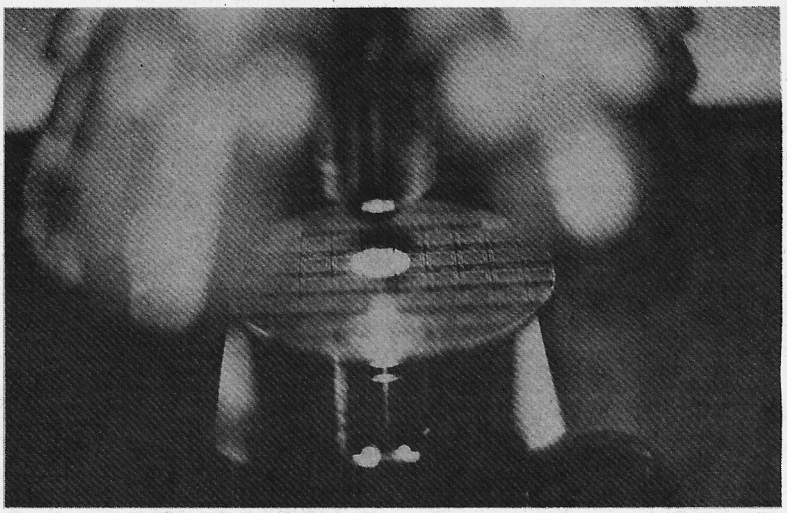
SPU organized

Tektronix in forefront of GaAs research

By CAROL TALLEY



The gate array chips on this 2-inch gallium arsenide (GaAs) wafer each contain 1,200 gates and are capable of clocking at over a GHz at 100-200 microwatts per gate power. The GaAs SPU will be working with 3-inch wafers when they move to their new lab in Microelectronics (Bldg. 59).

Gallium arsenide . . .

If Agatha Christie set one of her mysteries in outer space, surely a glass of Tang laced with gallium arsenide would be the murder potion, right?

Well, not quite so. In reality, gallium arsenide is a chemical compound used to make extra-high-speed, ultra-state-of-the-art integrated circuits, and, in that less nefarious role, is the force around which one of Tek's newest organizations revolves.

The new group, the Gallium Arsenide Strategic Program Unit, was put together barely half a year ago, the natural offshoot of GaAs research Tek has been involved in for five years.

Gallium arsenide is the vanguard of the family of materials known as the III-V compounds, so named because they are found in the third and fifth column of a chemist's Periodic Chart of the Elements. While other III-V materials have semiconductor potential, indium phosphide for one, most of the attention is on gallium arsenide. "But that's only because there is more of it available to work with," said SPU general manager Al Patz.

GaAs has the advantage of being faster, requiring less power, and operating at higher frequencies than silicon, the material used to make today's integrated circuits. It's also been known to scientists for a long time, but until recently GaAs crystal production was inefficient and expensive—impractical for everyday use on the manufacturing line. However, recent technological breakthroughs are making the material more manageable to work with.

GaAs still has a way to go—experts say 10 years—before it becomes as common as silicon in chipmaking. And while it will never replace silicon completely—the old workhorse is still a better buy for 95 per cent of applications—a recent *Oregonian* newspaper article stated that "the GaAs chip has the potential to revolutionize the computer industry." Integrated Circuit Engineering Corp., an Arizona consulting firm, predicts a $2.3 billion GaAs IC market by 1990.

Says Al, "The talk about the chip "revoluntionizing" the industry is based mostly around the speed of the thing: GaAs IC's allow information to be processed five to eight times faster than those made from silicon. They also require less power to operate, and in IC technology speed and power is the name of the game.

"Another unique feature is that GaAs is 'radiation hard': It can withstand substantially more radiation than silicon. The military is extremely interested in that feature, mostly for use in satellite applications."

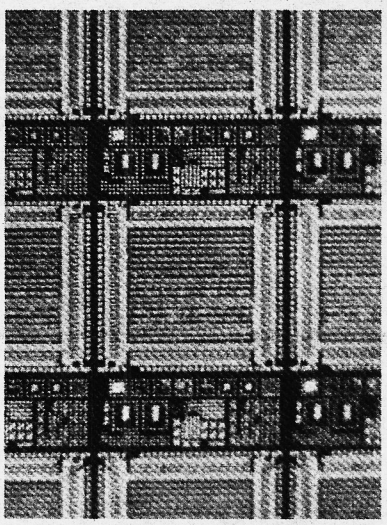
The III-V materials are also considered "optoelectronic," meaning they generate light: Long-range telecommunications and lasers, which rely on optical circuits, are other areas fraught with application possibilities.

Although Tektronix has been interested in GaAs for some years, that interest took on new meaning a year and a half ago when GaAs researchers from Technology Group started talking to the divisions about incorporating the new technology into their products.

Next, the decision had to be made whether to keep the technology for Tek use only or to also sell it to the outside. The potential market, from all accounts very attractive, was not the only factor to consider. There were philosophical implications as well: A "sell" decision would mark an important break from an established Tektronix doctrine.

An article that appeared in the December industrial edition of *Business Week* magazine explained: "The unwritten credo was that Tek-developed technology was to be used in Tek products, or not used at all—the company was not in business to make components for other manufacturers, let alone competitors. Any suggestion that the company's technological riches be sold to outsiders 'would have been heresy,' said William D. Walker, Tek executive vice president."

The GaAs effort illustrated a problem with that rationale: Simply, that because the production process was so expensive, if Tek didn't sell outside, it would be hard-pressed to justify the investment. As Bill elaborated in the same article (tellingly headlined "Why Tek Stopped Hoarding its Technology"), "The alternative is not to have the latest and best technology for our own products," he explained, "and we want the best."



(As an example of the magnitude of the costs involved, three very well-heeled organizations, Rockwell International, Honeywell Inc., and the Department of Defense, recently announced an agreement to build a pilot production facility. The $40 million tri-venture is expected to be ready in 2½ years.)

Figuring out how to turn "the latest and best technologies" into live operations required another round of creative thinking. Enter the SPU. Officially announced in autumn of last year, a Strategic Program Unit is a sort of embryonic division set up on a profit and loss basis to test the waters of a potential technology market. So far, Tek has four of them.

The aim, according to the *Business Week* story, is to "duplicate the entreprenuerial fervor of a start-up company." Like a start-up, a SPU is small, flexible, and focused. Also like a start-up, it's a higher-risk venture. On one hand, success could spell evolution into a full-fledged division. On the other, should assumptions prove invalid, an SPU could close up shop with relatively less trauma than could a more established group. "That's the beauty of the thing," said Al.

With that, the GaAs SPU was announced in mid '83. Shortly thereafter, Al, who was Finance and Operations manager for Technology Group, was named manager and told to build the organization. Most of the slots were filled by veterans from the GaAs research area; today the group numbers about 40.

Thanks to the already-existing Microelectronics Building (59), considerable time has been saved getting a manufacturing facility up and running. June of this year is the target for having the line—which includes a 10,500 square-foot clean room—ready. Al says that in this type of business it takes a long "cycle time" to build the customer base so the wait won't affect sales.

"Timing is important," he said. "We have the leading edge in the U.S. in terms of technology and capacity. Probably a one-and-a-half to two-year edge. It's critical to capitalize on that, both in our internal products and external marketing efforts."

External-marketing-efforts-wise, the only advertising Al has done has been a January press release stating that the group was open for business. The result has been a flood of phone calls.

"At this point we're only selling on a contract basis to non-competitors," he said. "What we do is license our design manual to the client who then designs the IC he wants. We in turn build it, using our facilities and process. That's how we'll operate with Tek divisions also."

One Tek organization making use of GaAs IC's are the Microwave Technology people in Communications Group's Frequency Domain Instrumentation division. "Our operation supports spectrum analyzer instrument development by designing special components and manufacturing them," said manager Phil Snow.

"We're looking at GaAs as the replacement technology for distributed microwave circuitry and have supported the effort for the past five years. We're working at the higher frequencies, up through 20 GHz, that you can't get to with silicon.

"We have one device now that we plan to have available in the near future that can be retrofited into an existing product for improved performance and manufacturability."

Phil is adamant in his support: "Let's just say that if we don't go with GaAs IC's we don't have a viable future in the microwave components business; that's how strongly we feel about it."

Meanwhile, the research goes on. Tek's interest in knowing more about GaAs and the other III-V compounds extends far beyond the lab in Building 59. Projects are underway at the Oregon Graduate Center, Oregon State University, and the University of Oregon, all at least partially funded by Tektronix and/or the Tek Foundation and/or gifts from the trust of the late Tek co-founder Jack Murdock.

(One indication of Oregon's/Tektronix' status in III-V research is that the third international conference on the materials will be held this month at the Kah-nee-tah resort.)

"We look upon these activities as an extension of our own group," said GaAs Process and Development manager Rich Koyama. "We couldn't afford to undertake that amount of research on our own, so we're working with the schools."

Research results are public information; despite Tek's role as project bankroller, the company places no restrictions on their use. Rich did, however, mention that the institutions are not doing any proprietary work.

"We've tried to stay in touch with as many of the developments in III-V compound research as possible," said Al. "We can't just rely on what we have today, but also on what we'll need in the 1990's to keep our business viable."

And in terms of the IC business, viability is still measured by the hallmark of speed; Al definitely takes issue with those who think integrated circuit-based tools, especially computers, have become as fast as they need to get. "We haven't even come close to seeing computer technology slow down," he says.

"Computer programs are getting so complex, and the data bases so huge, that many, many programs take all night to run. Anyone who's worked in that situation knows that the need for more speed and capacity is still there."

The new GaAs chips support that kind of thinking: Scientists using III-V chips this year in a test at Bell Laboratories in New Jersey were able to transmit digital information at a rate equal to that of sending the entire text of the Encylopedia Britannica over 60 miles in less than half a second. (Technically speaking, that equates to 104 kilometers at the rate of 1 billion bits per second.)

Working with that kind of cutting-edge technology has the GaAs people pretty excited. "To say this is a very turned-on group of people is an understatement," Al said. "We always suspected this team was good, but recently we've had that confirmed by people from outside who've told us we've advanced further with fewer people than any other research group in the U.S."

So, while it's a bit premature to say that the Portland area could someday rival the Santa Clara suburbs as the chip-making-est valley in the west, Tektronix—and Oregon's—role in whatever does happen with GaAs technology seems assured.

"Tek is home to the best team in the country," repeated Al.