born children in five areas of the world. Cann found that mitochondria of Africans had the widest diversity of any group she sampled, indicating the greatest degree of evolutionary change. Assuming that the African environment has not changed dramatically, this means that "their mitochondrial DNA is the oldest," and is thus the original DNA from which other races have descended.

Because mitochondria are only inherited from the mother, Cann suspects that the oldest traceable human ancestor was a woman (whom she names "Eve") who lived between 285,000 and 143,000 years ago. She argues that science's next project should be to find out if a similar evolutionary path can be found in the male Y chromosome. Only then, she concludes, can scientists debate whether the first known human man (Adam?) "lived at the same time and in the same place as Eve."

The Gallium Age

"After Silicon" by Lee Edson, in *Mosaic* (Summer 1987), National Science Foundation, Washington, D.C. 20550.

Silicon is the material that defines our times. Because it is the primary element of computer microchips, silicon is as important to our age as steel was to the 19th century and bronze was to the Greeks of 3,000 B.C.

Although silicon's importance will continue indefinitely, says Edson, a free-lance science writer, many of its functions may be taken over by gallium arsenide, a synthetic semiconductor. While silicon will not be completely replaced, he argues, gallium arsenide may "carve out its own considerable niche in the silicon era."

Gallium arsenide has several advantages over silicon. Because its crystalline structure allows electrons to move freely, switches made from gallium arsenide can operate 10 times faster than equivalent silicon switches. Gallium arsenide chips run on one-tenth of the electricity used by comparable silicon switches, and are better able to resist radiation and temperature changes. Gallium arsenide also emits light when a current is applied to it, which makes it a useful material for making lasers and integrated circuits.

Although electrical engineers have known about gallium arsenide's properties since 1952, the first transistor-grade crystals were not grown until the 1970s. In the past decade, engineers in the United States and Japan have been able to fuse gallium arsenide with other elements to create transistors of extremely high power. One of the *Modfets* field-effect transistors developed by Hadis Morkoc of the University of Illinois and P. Z. Chao of General Electric has obtained speeds—in terms of frequency of operation—of 230 gigahertz, or 230 billion times a second.

New uses, however, may yet be found for silicon. British researcher R. C. Chiddick is developing "amorphous" (solid) silicon, which could be used for low-cost solar cells and flat television screens. The Pentagon's E. N. Maynard is leading an effort to produce chips that have one million or more devices on them.

But some 5,000 researchers will continue to study gallium arsenide. The reason: Potential profits from this "blessed material" have been "estimated in the multibillions of dollars."