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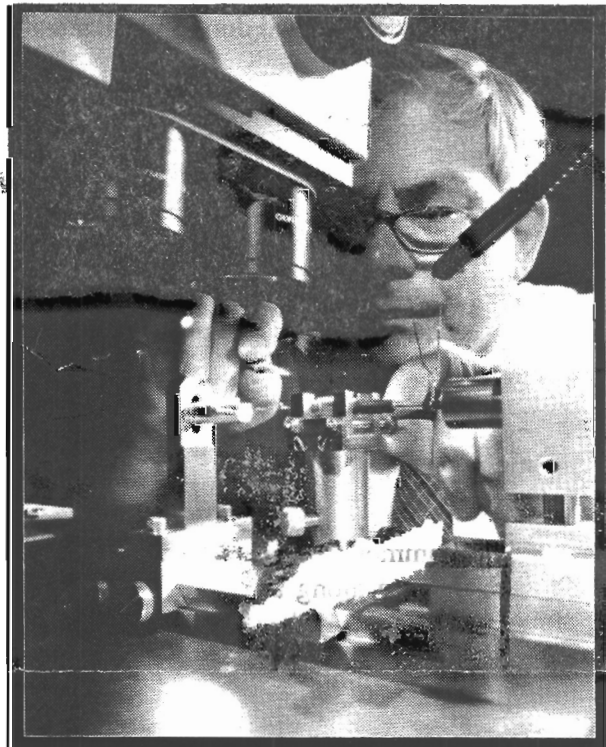
WHAT'S GOING ON INSIDE YOUR COMPUTER? HILLS AND VALLEYS GROW AS ATOMS TRAVEL -- CAUSING FAILURE IN MICROCIRCUITS

Don't look now, but strange things may be happening deep within your computer's microcircuits, as atomic-scale hills and valleys grow in the thin metal conductors used to carry electronic information.

Known as solid state electromigration, this microscopic construction activity causes premature failure in electronic devices. As circuit designers shrink the size of electronic components to crowd more and more of them onto chips, electromigration becomes an increasingly important concern.

"When even a small electric current is run through these minuscule metal conductors, high current densities are built up within their narrow confines," explained Dr. Bill Livesay, principal research scientist in the Georgia Tech Research Institute (GTRI) and a participant in Georgia Tech's Manufacturing Research Center. "This causes atoms within the metal films to move out of place or migrate, causing degradation and ultimate failure of the device."

Movement of the atoms creates voids in the extremely thin metal film, which can be less than a micron wide -- or about 1/50th the diameter of a human hair. These voids coalesce and increase in size, reducing the amount of



Dr. Bill Livesay places a section of metal film into a microtensile device to study the effects of electromigration. The work is being done in the Manufacturing Research Center. (Color/B&W Avail.)

conductor left to carry electrical current. In turn, that further increases the current density, accelerating the growth of the void until the current density becomes so large that the remaining conductor melts -- and the device fails.

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