

Forty Years of Flip Chip and Solder Bumps

Paul A. Totta

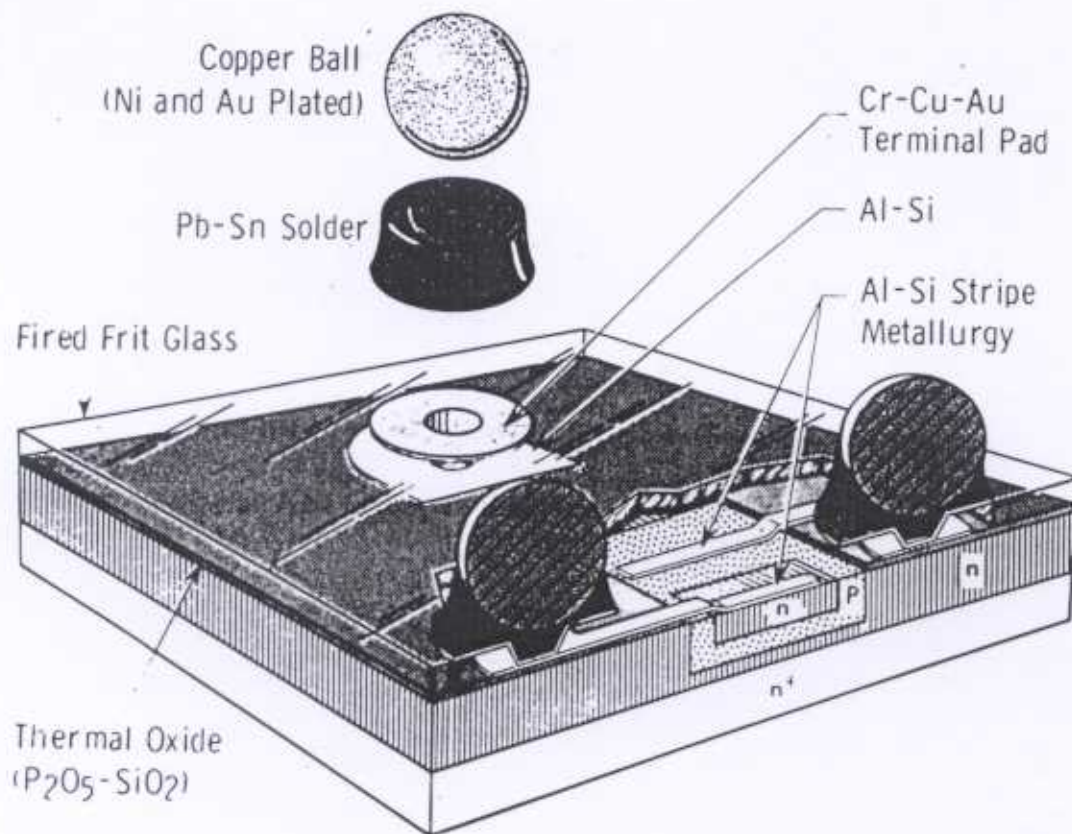
IBM Fellow Emeritus

IBM East Fishkill Facility

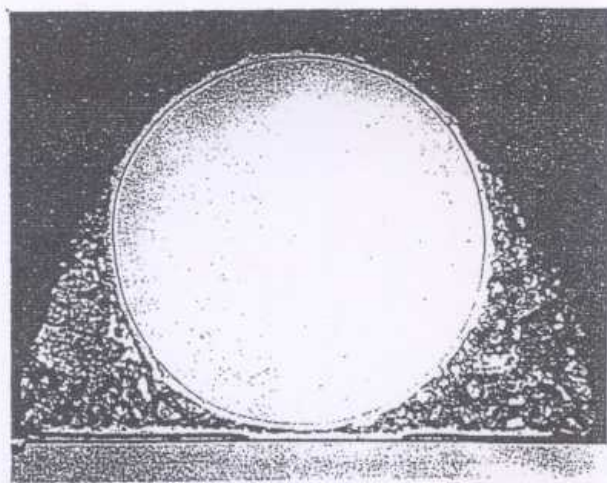
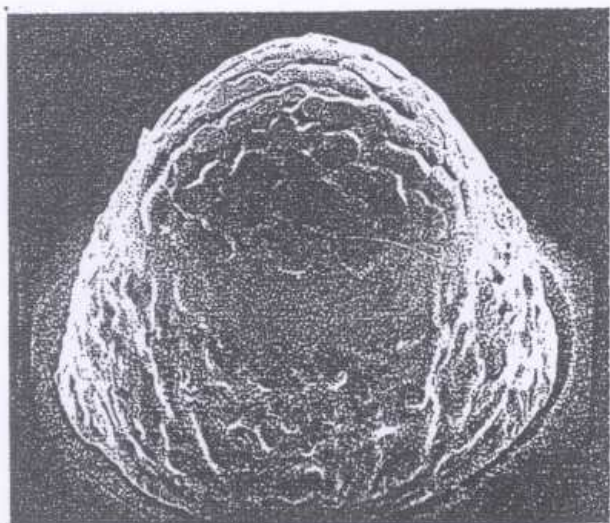
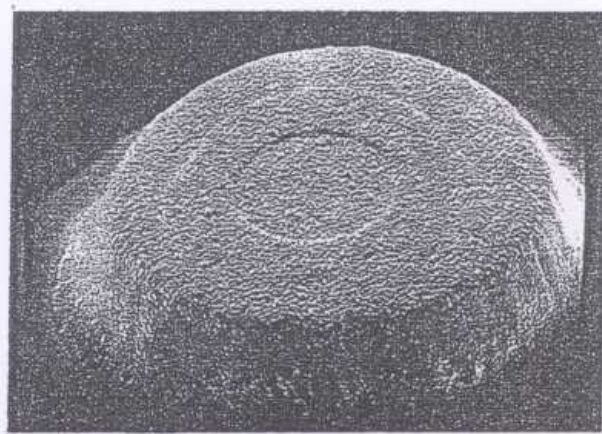
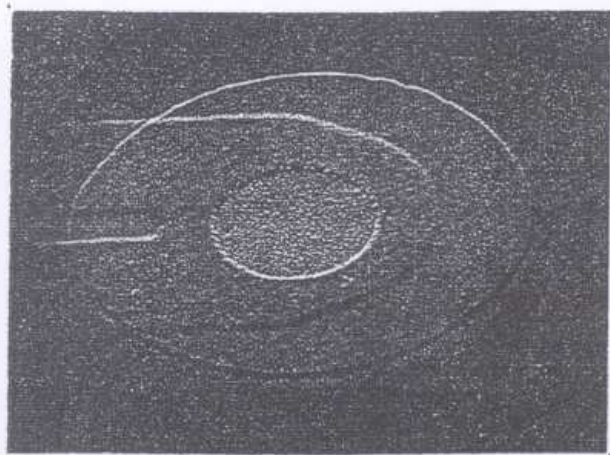
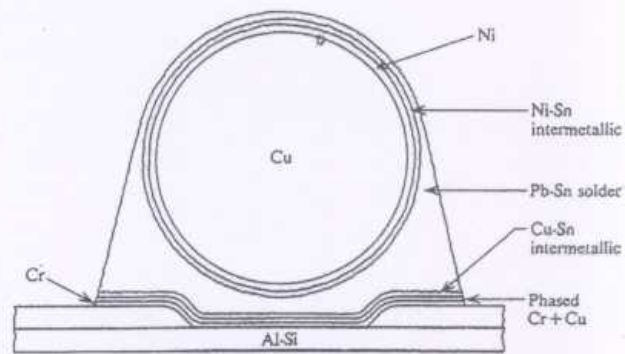
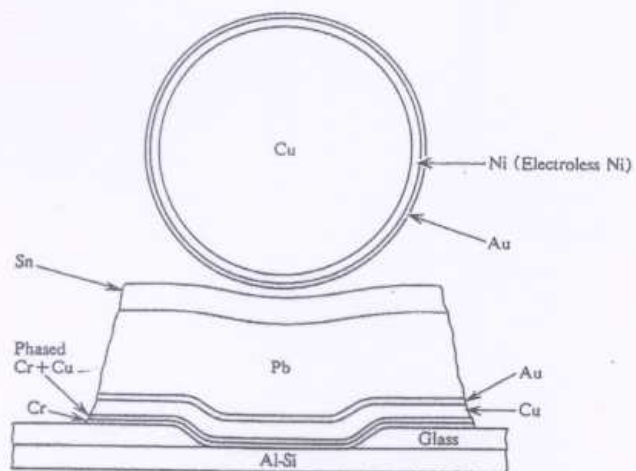
Hopewell Junction, NY 12533

UCLA Pb-free Workshop

September 5-6, 2002

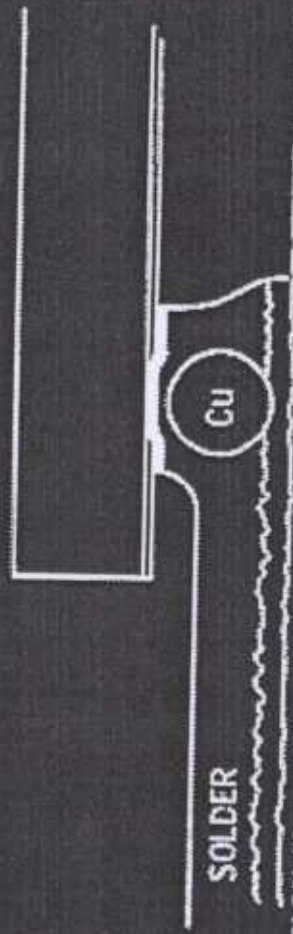


FIRST FLIP CHIP (SLT - 1964)

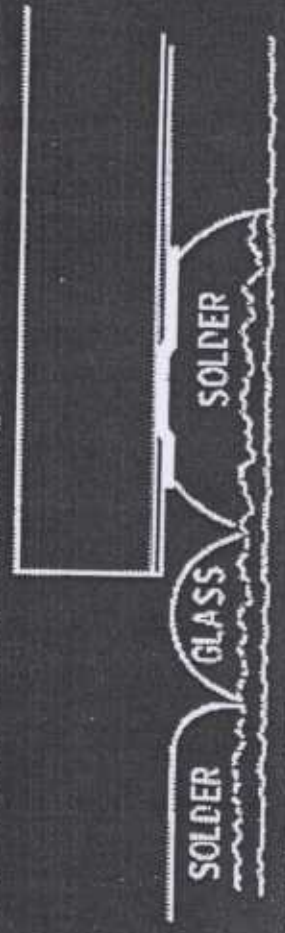




PROBLEM: COLLAPSED CHIP

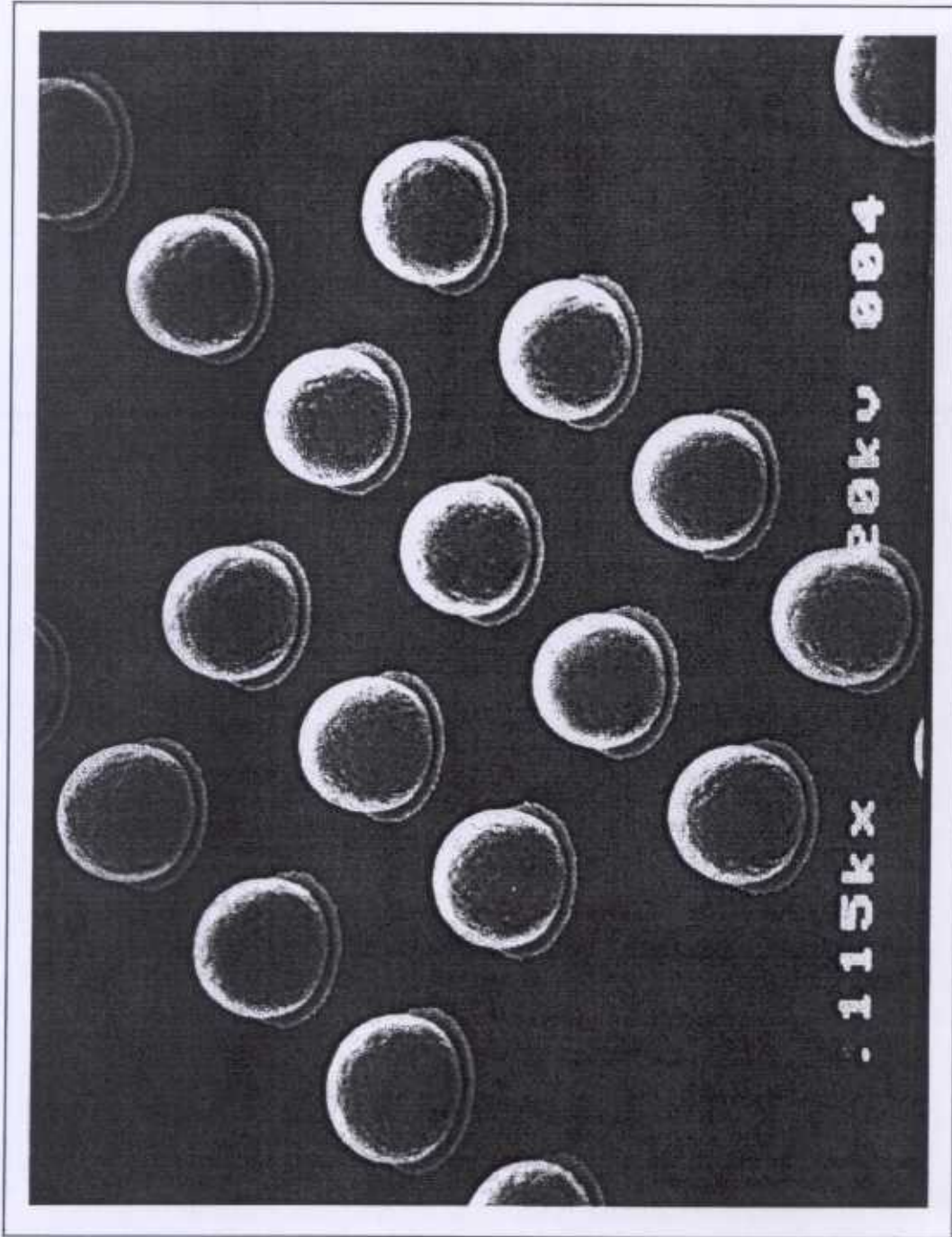


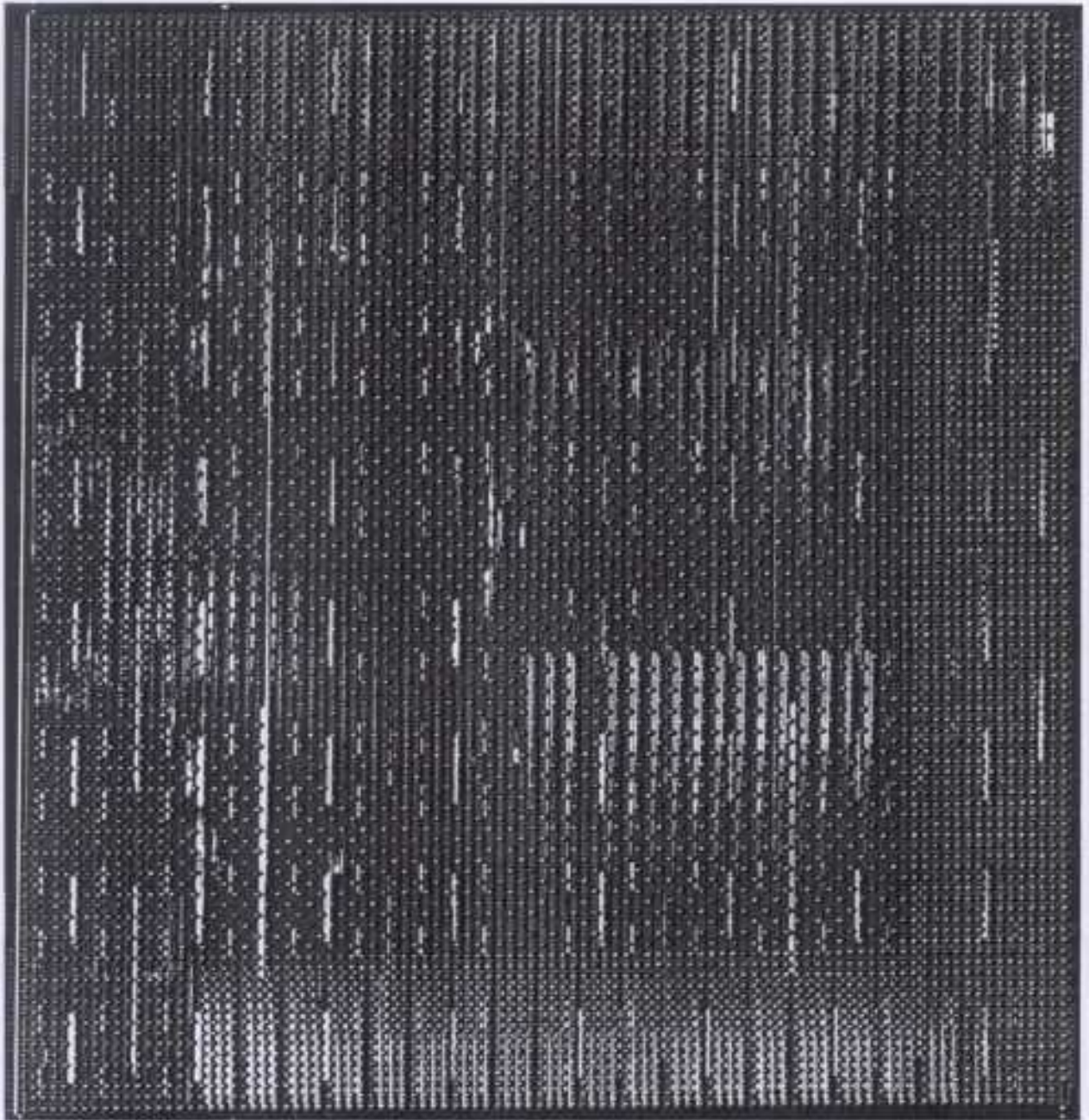
SOLUTION #1: COPPER BALL TERMINAL



SOLUTION #2: CONTROLLED COLLAPSE CONNECTION

Typical Electroplated C4s





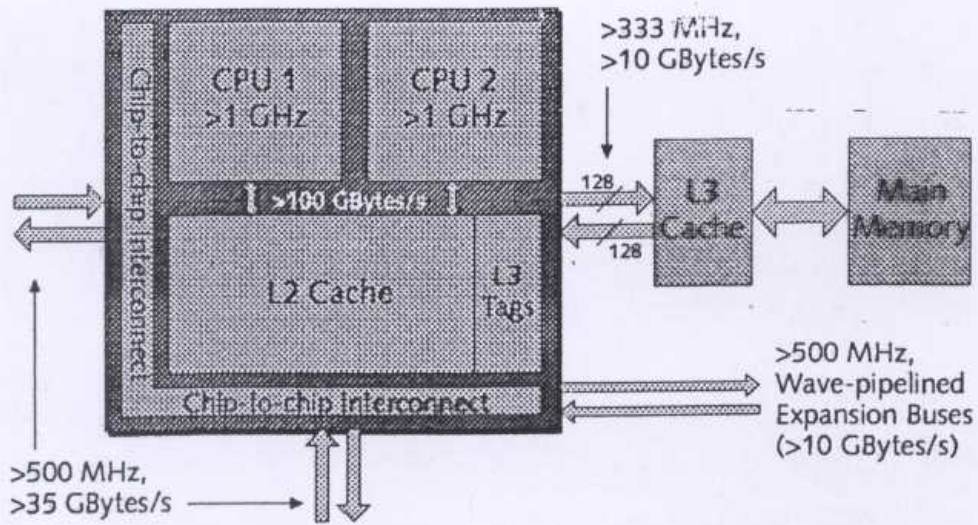


Figure 1. Power4 includes two >1-GHz superscalar cores with more than 100 GBytes/s of bandwidth to a large shared-L2 cache and more than 55 GBytes/s of bandwidth to memory and other Power4 chips.

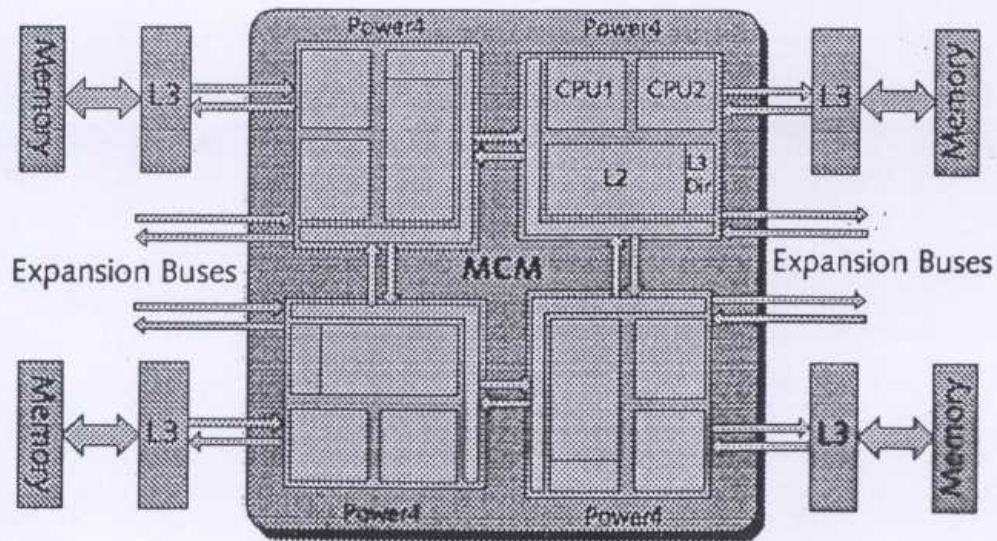
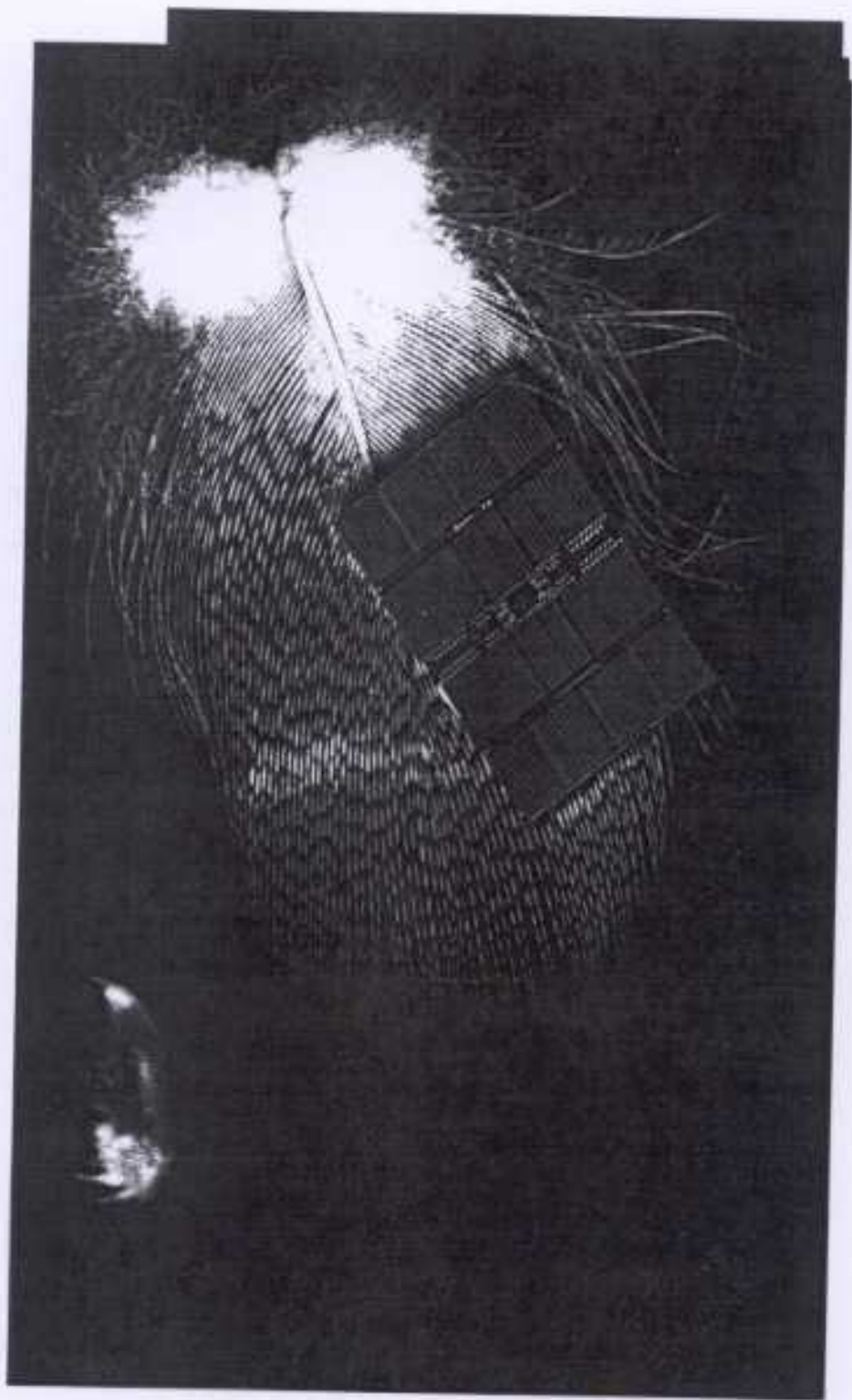
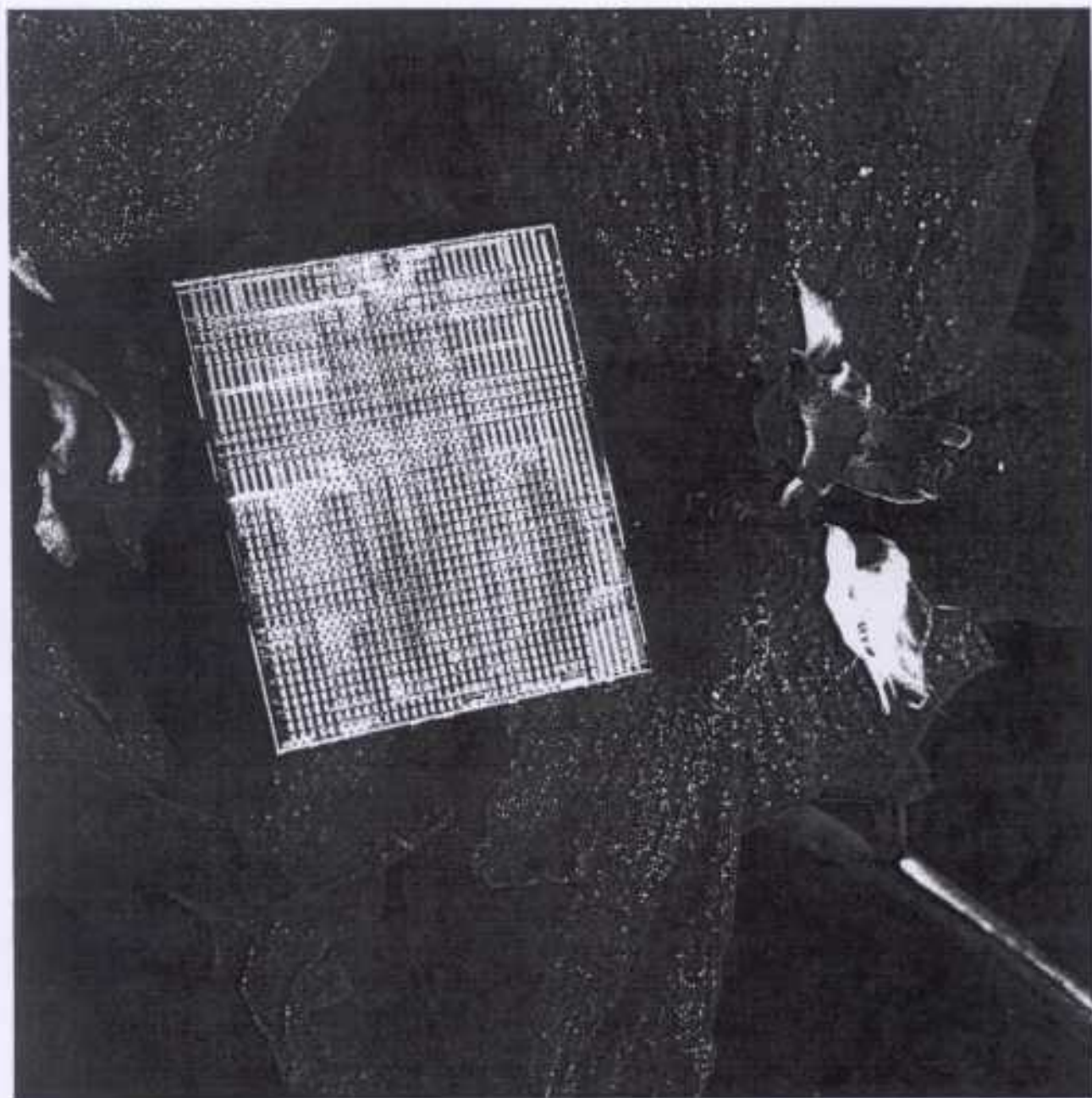


Figure 2. Four Power4 chips will be offered in a single MCM package as an eight-processor SMP with total bandwidths of 40 GBytes/s to memory and 40 GBytes/s to other modules.





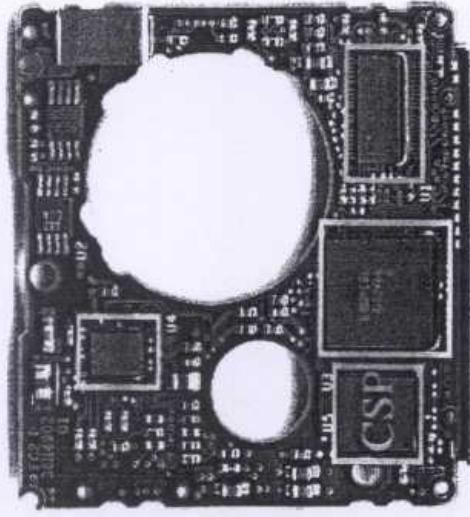


MICRO DRIVE

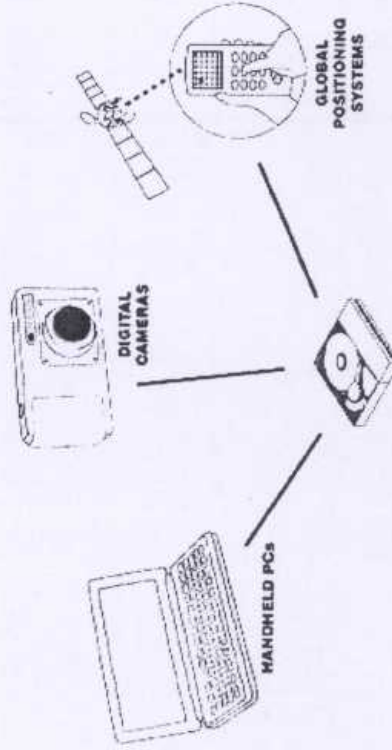
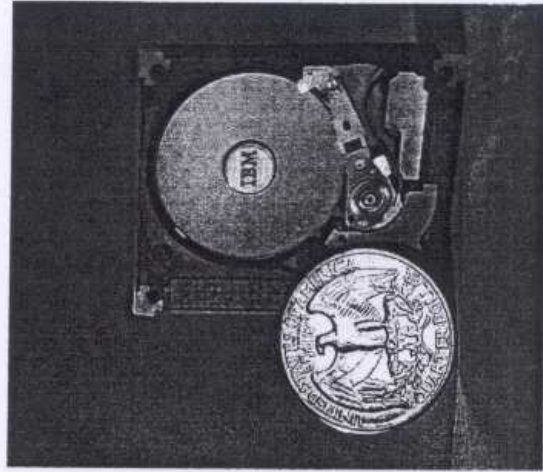
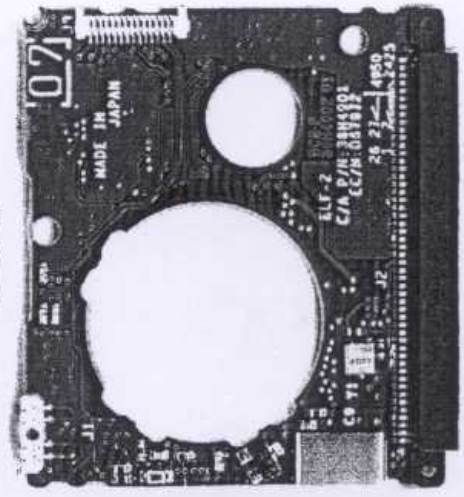
Product Overview

- Capacity : 340MB/170MB
- Form Factor : 42.8 x 36.4 x 5.0mm(CFA-Type2), 40g
- Raw Card : SLC 1+1 2s2p, 0.4 mm thickness
- Packaging Technology : FCA(3) & CSP(1)
- Battery Powered : 3.3V

Front

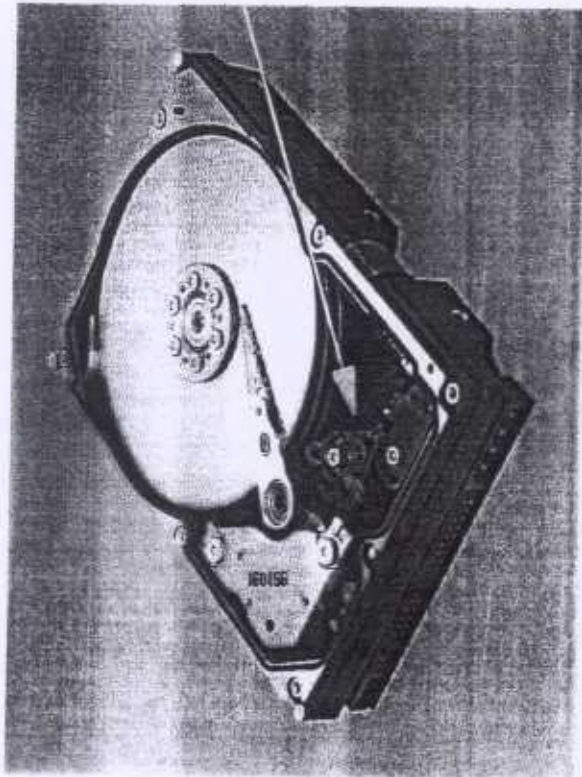


Back





C4 Flex Assembly



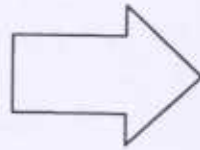
- **High Electrical Performance**
Close Placement of Preamp to Head
- **Smaller Form Factor for Thinner HDD**
- **Comfortable Price Offering**



Traditional FLEX Assembly

Solder Joint

Semiconductor



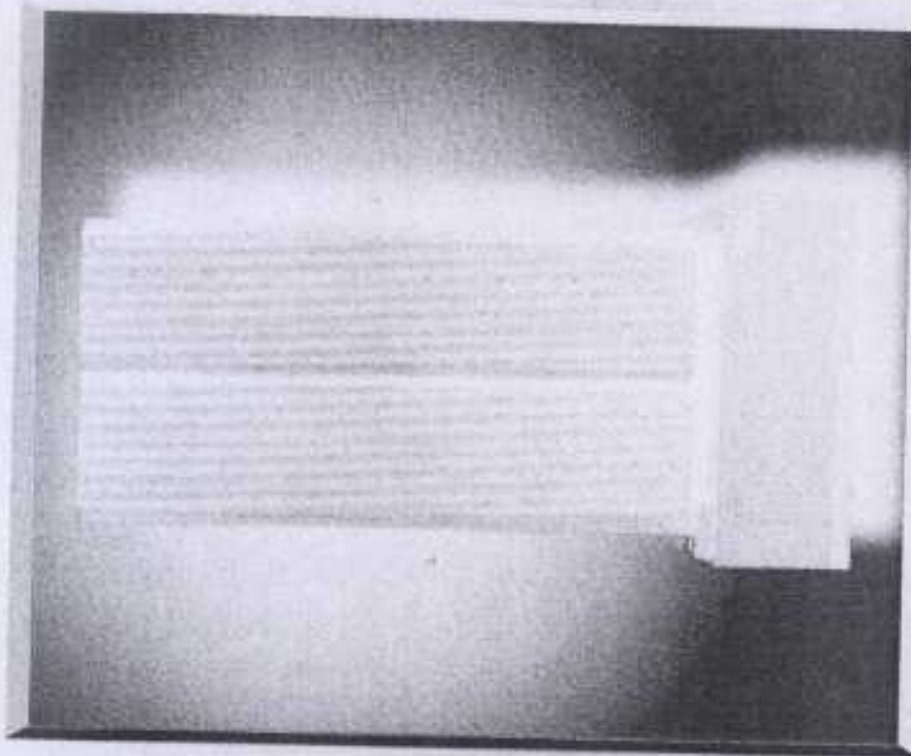
Flex Cable

Tin Capped C4

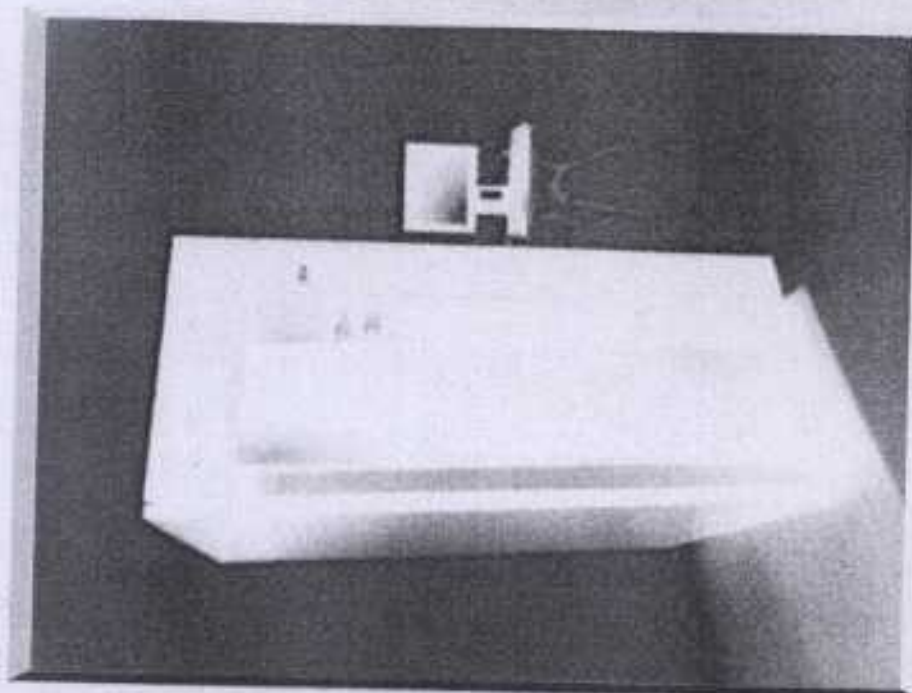
71mm

26mm

C4 FLEX Assembly



RS/6000SP

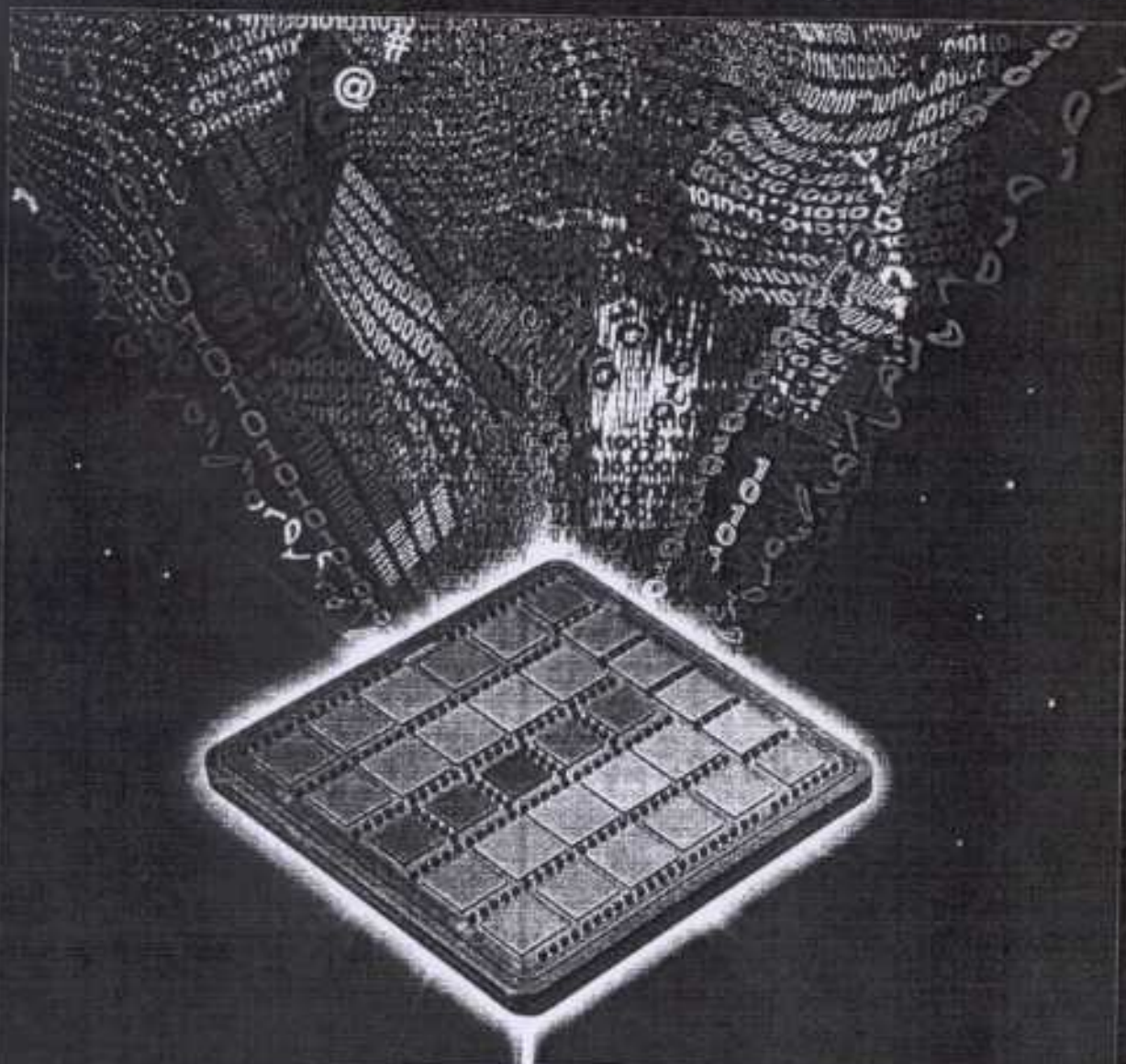


S/390



OPERA G6

Managing Data Flow in a Complex World

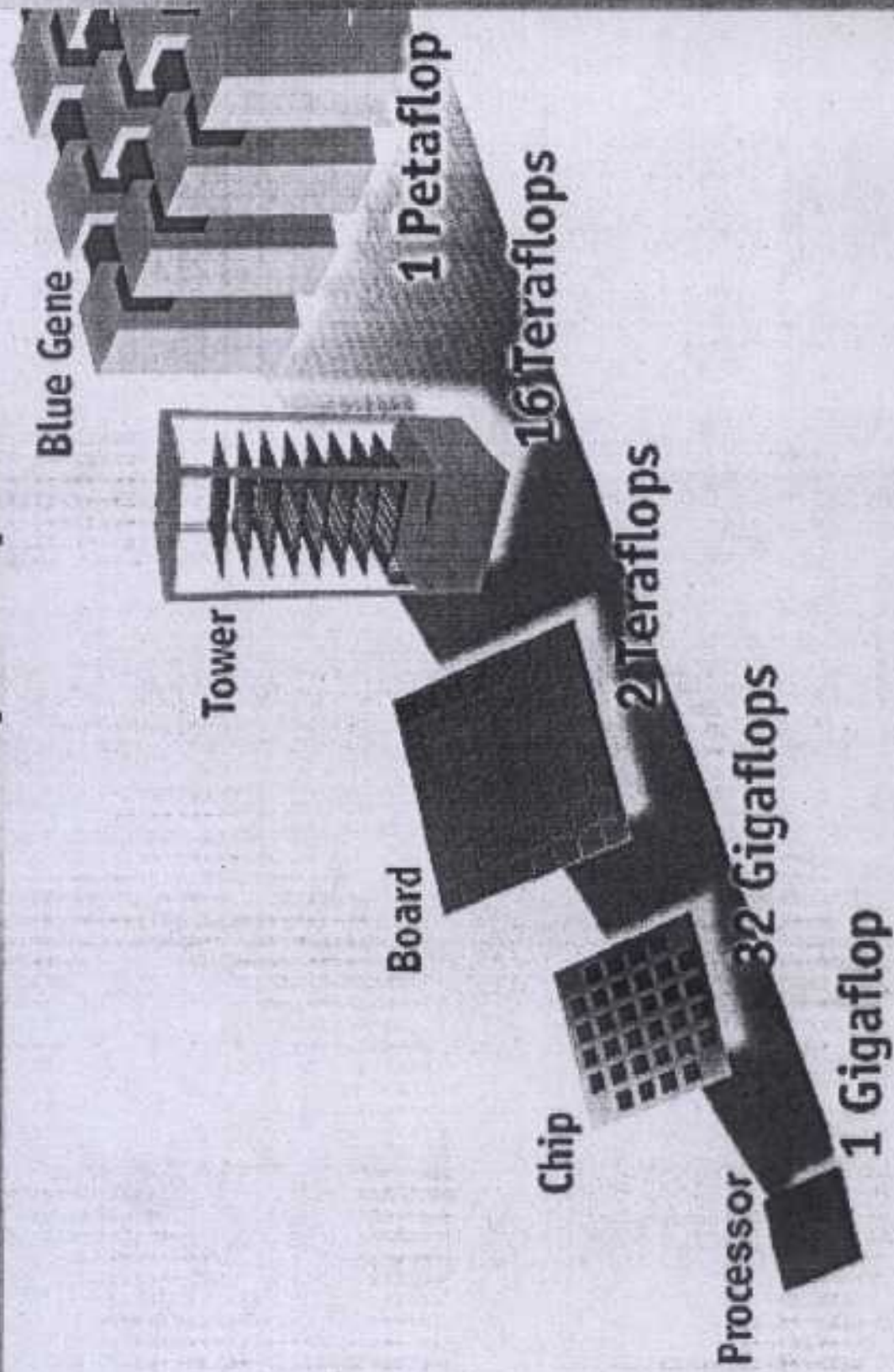


625 Megahertz...MD-S/390 Partnership
Unparalleled Performance and Reliability

IBM

Blue Gene

Five Steps to a Petaflop Computer



To Paul

From his 40 years
of IBM colleagues
and friends
- Well Done -



W.M. HAMM

*"I've learned a lot in sixty-three years. But, unfortunately,
almost all of it is about lead"*