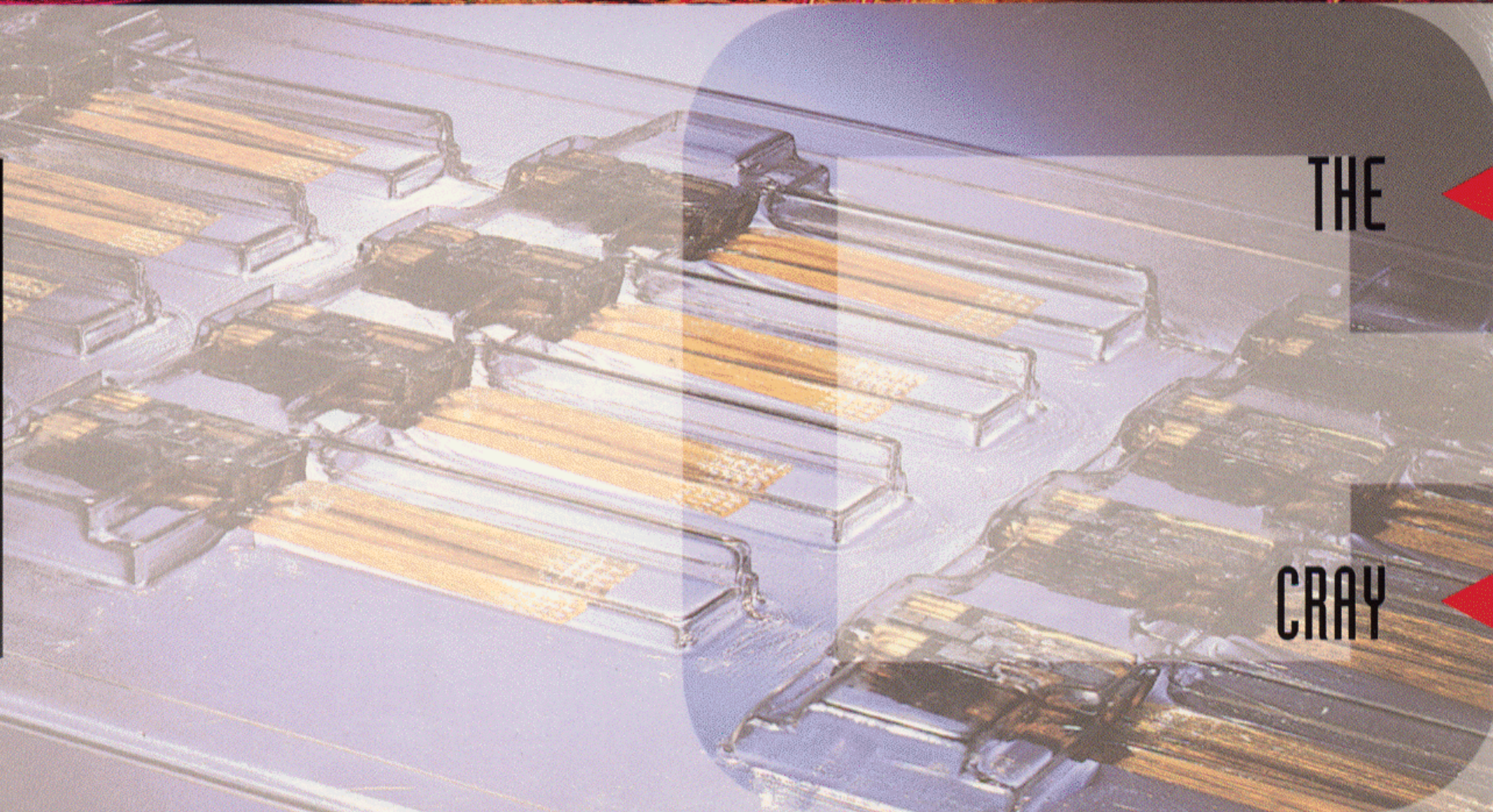
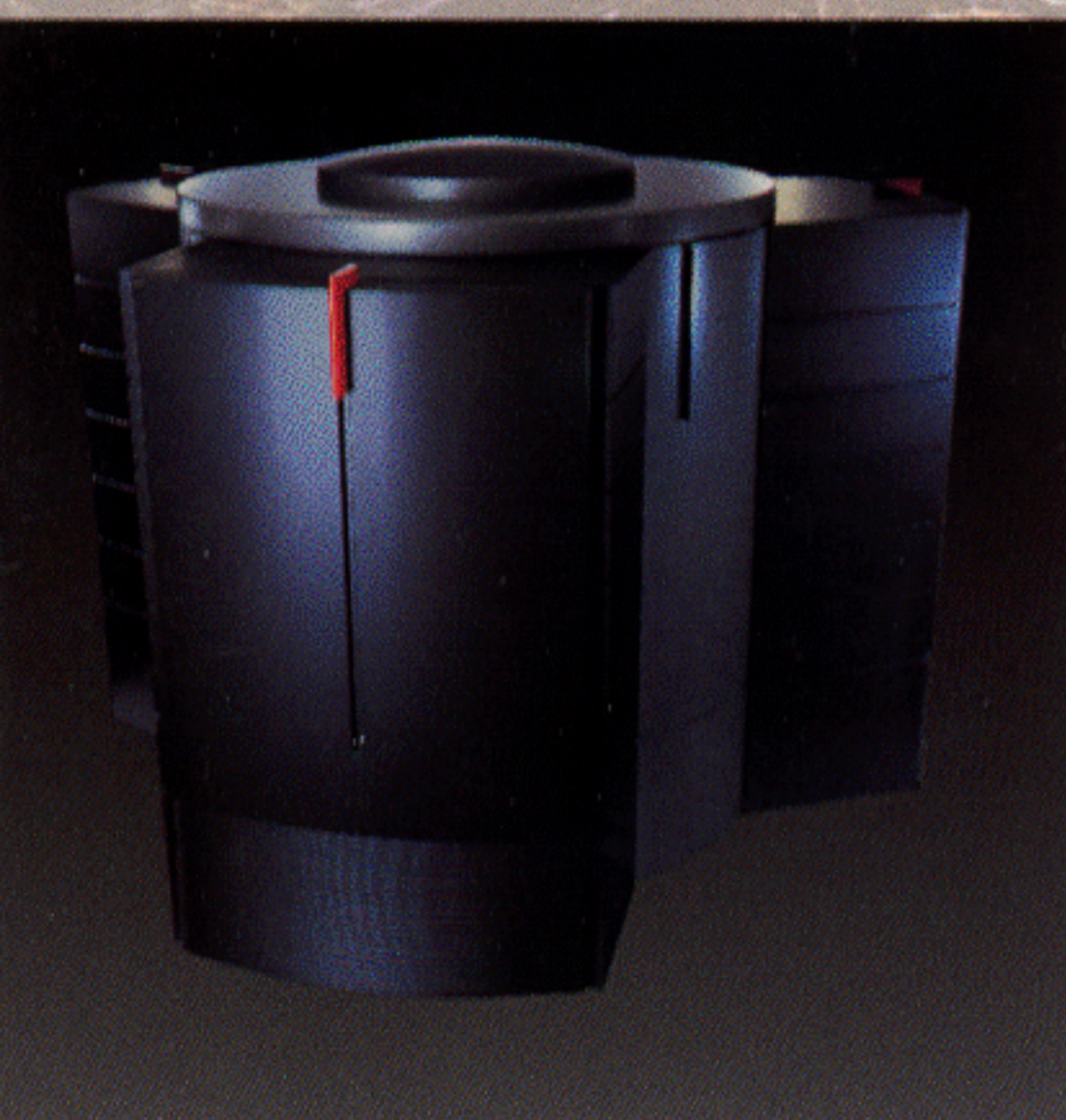


# BREAKING COMPUTATIONAL BARRIERS



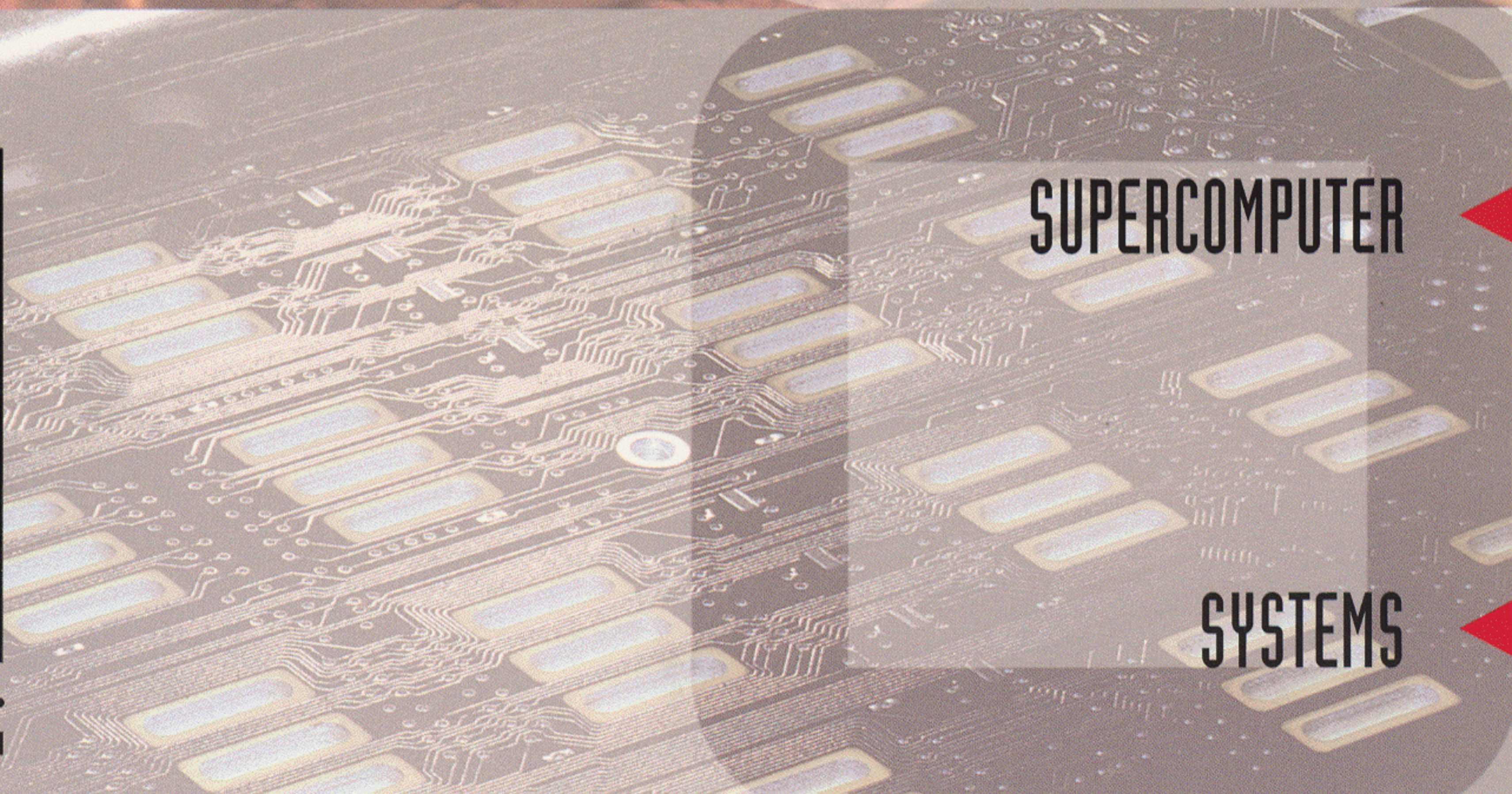
THE

CRAY



C90

SERIES OF



SUPERCOMPUTER

SYSTEMS

# BREAKING COMPUTATIONAL BARRIERS

## THE CRAY C90 SERIES OF SUPERCOMPUTERS

CRAY C90 systems are the most powerful general purpose supercomputers available for technical computing. To provide unmatched problem-solving capabilities, CRAY C90 systems feature a balanced architecture with the following advantages:

- ❑ *1 to 16 powerful CPUs.* Each CPU has a peak performance of 1 billion floating point operations per second (1 GFLOPS). Combined with the most advanced parallel processing software in the industry and the highest level of memory bandwidth available, CRAY C90 systems deliver sustained GFLOPS of performance on a wide range of applications.
- ❑ *Up to 1 Gword (8 Gbytes) of high-speed central memory.* The CRAY C90 systems enable users to run large jobs in-memory with up to four times the central memory capacity of the original CRAY Y-MP C90 system.
- ❑ *Up to 256 I/O channels providing up to 13.6 Gbytes/s I/O bandwidth.* To provide high-performance connections to peripheral devices and networks, the CRAY C90 systems

feature flexible I/O subsystems with the highest I/O rates in the industry.

- ❑ *MPP connectivity.* The CRAY C90 systems can be closely coupled to the massively parallel CRAY T3D system. For highly parallel applications, this heterogeneous architecture can deliver an unprecedented level of performance to a broad spectrum of users.
- ❑ *Optional SSD solid-state storage device for increased throughput.* An optional SSD provides very-high-speed secondary memory with up to 4 Gwords (32 Gbytes) of storage capacity and a maximum bandwidth of up to 13.6 Gbytes/s.

Introduced in 1991, the original CRAY Y-MP C90 system set new standards for usable computational power. Now, the full CRAY C90 family of systems scales this technology to an unprecedented range of sustained performance for breaking computational barriers.



CRAY C916



CRAY C98/C94



CRAY C94A/C92A

Model	CPUs	Central memory (Mwords)	I/O clusters	Optional SSD (Mwords)	Cooling	Peak performance GFLOPS
CRAY C92A	1 or 2	32-128	1-2	32-2048	Air or water	2
CRAY C94A	2 or 4	64-128	1-3	32-2048	Air or water	4
CRAY C94	2 or 4	64-256	1-4	512-2048	Water	4
CRAY C98	4 or 8	128-512	1-8	512-2048	Water	8
CRAY C916	8 or 16	128-1024	2-16	512-4096	Water	16

## Delivering supercomputer performance and user productivity through advanced software

All CRAY C90 systems run Cray Research's UNICOS operating system, a POSIX compliant, standard UNIX environment enhanced to deliver supercomputer performance and full production capabilities. Application performance and user productivity are maximized through advanced visual programming tools, data storage management systems, and networking software that connects to almost any existing computer environment.

To provide transparent access to CRAY C90 system performance, our software developers work to create performance innovations and new ways of solving user problems, while maintaining application portability and compliance with industry standards.

### Breaking productivity barriers with high-performance software

#### UNICOS

- Standard UNIX
- Batch and interactive processing
- Large job processing
- Efficient parallel processing
- Resource management
- Highest I/O rates in the industry
- Extensive accounting features
- Multi-level security
- Online system diagnostics
- Automatic data conversion (IEEE, IBM, CDC)

#### Programming environments

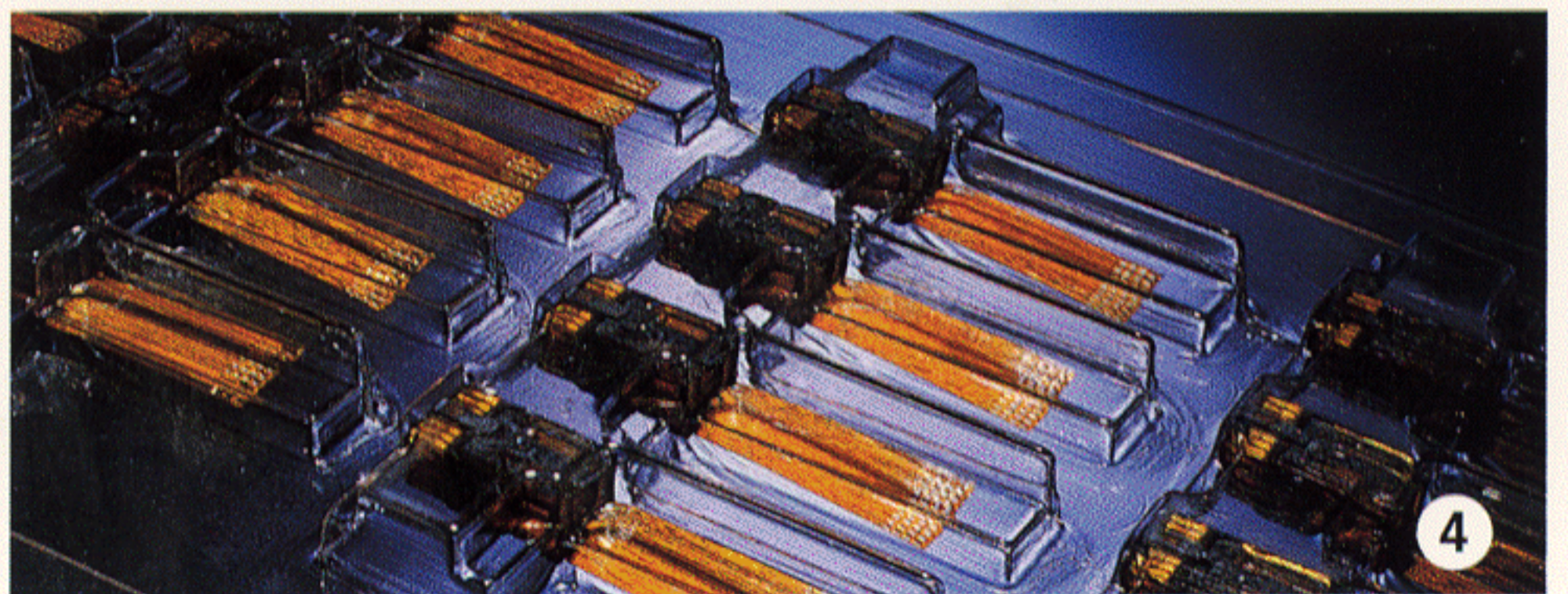
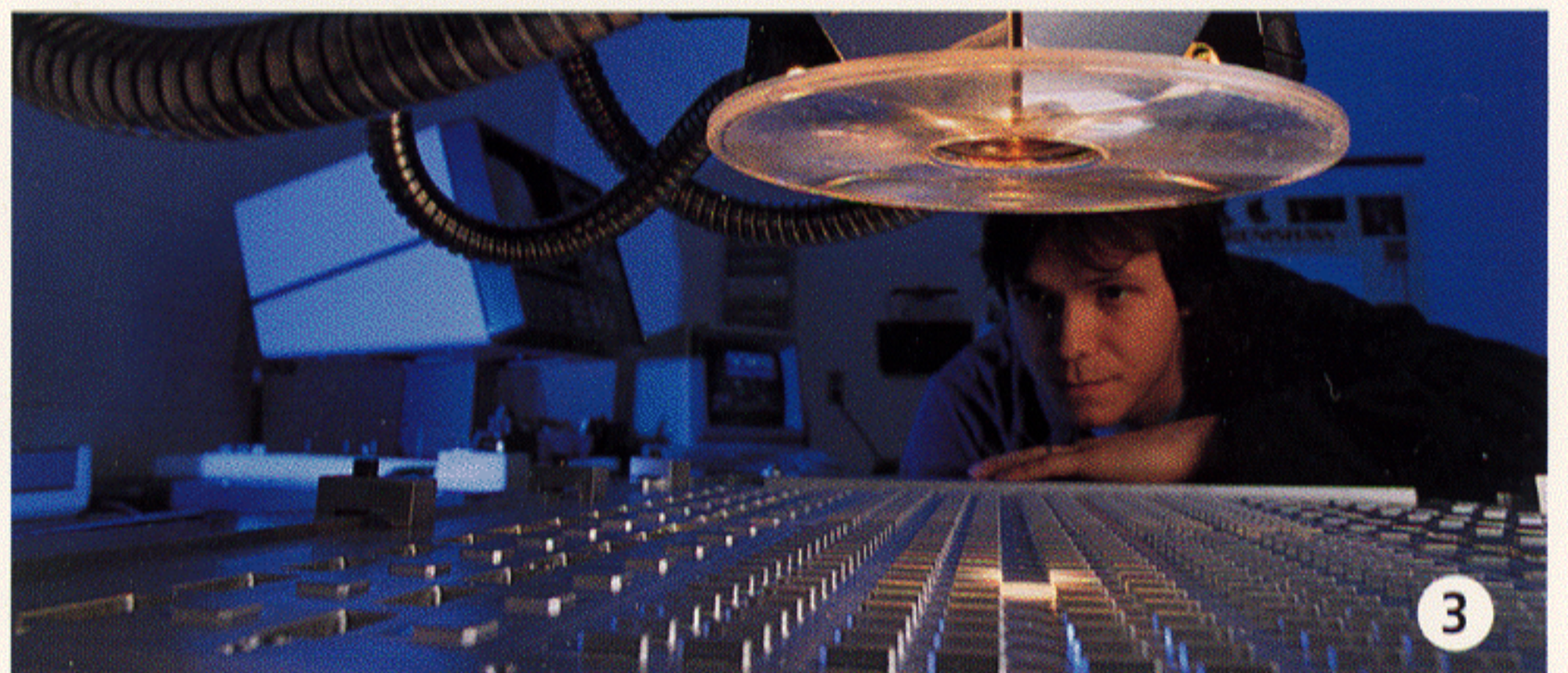
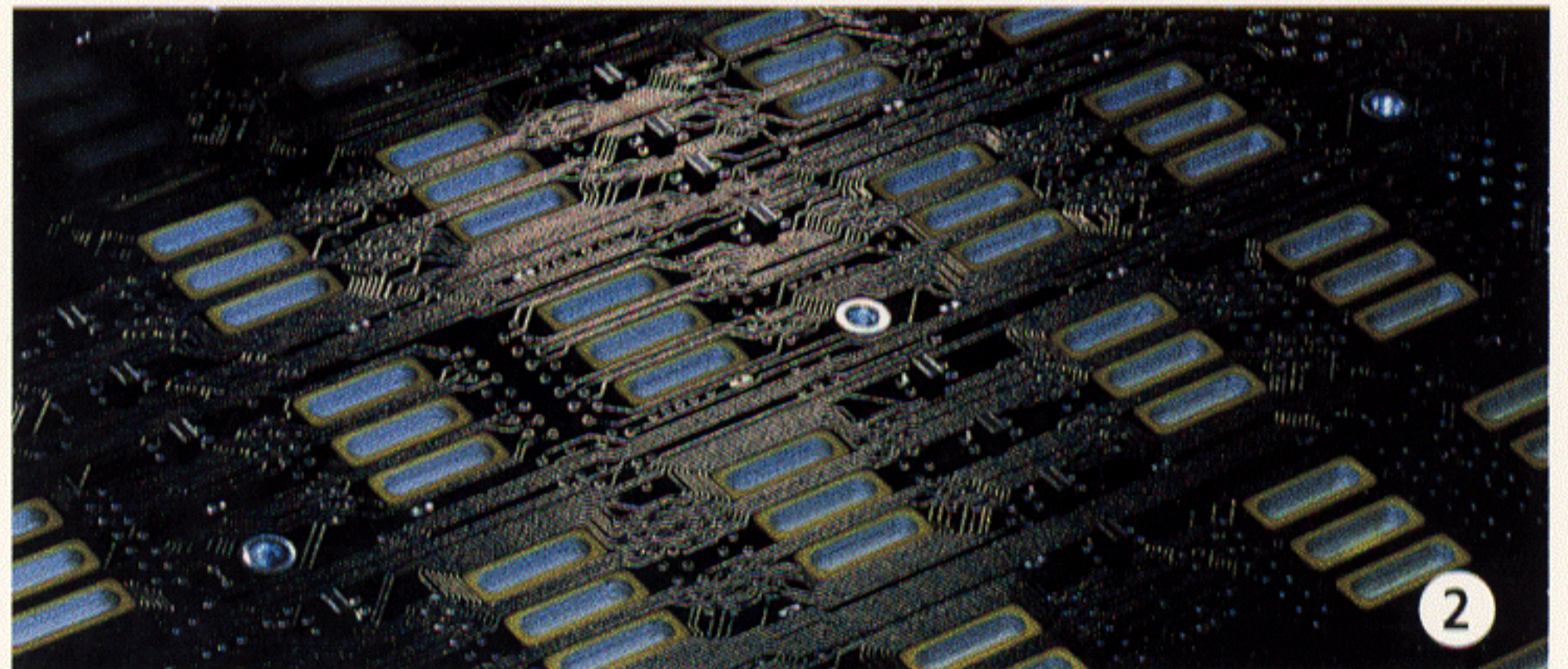
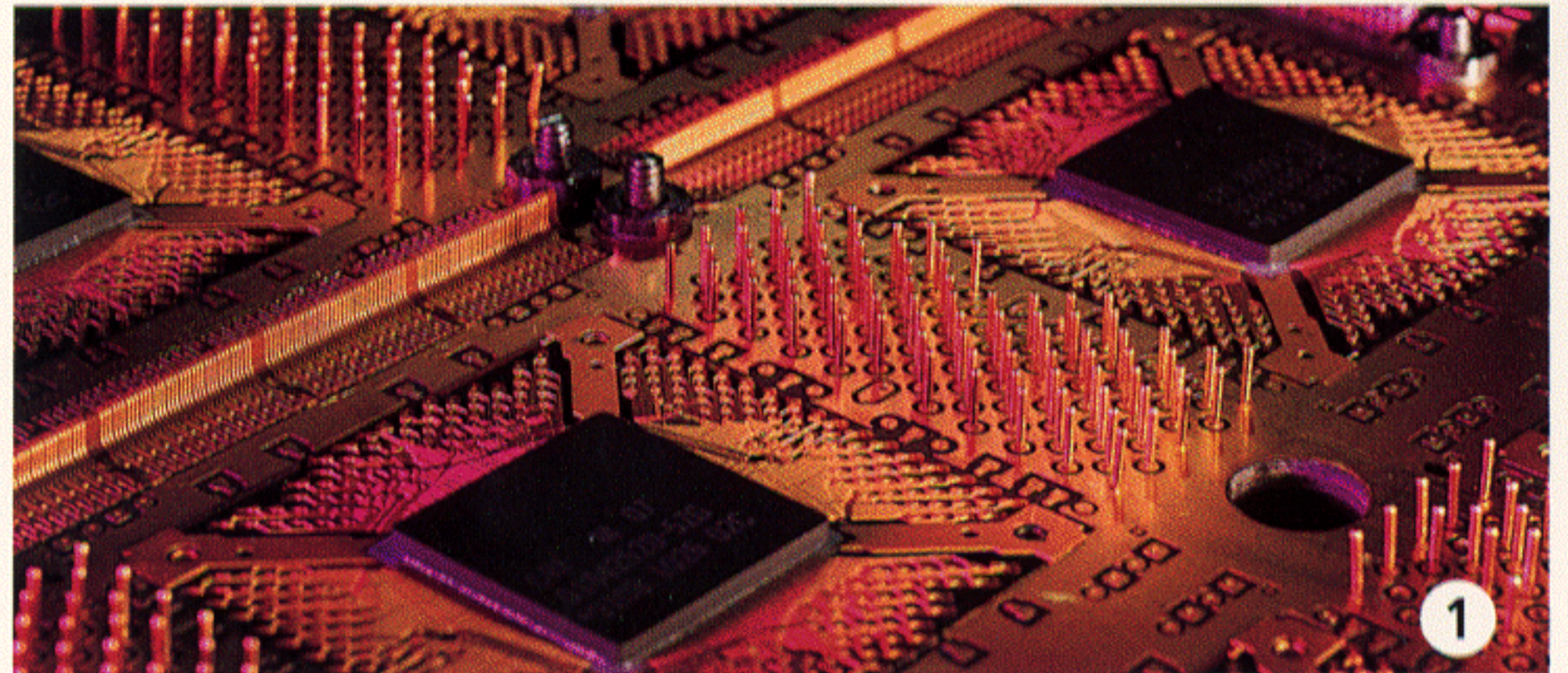
- Standard portable languages
- Industry-leading optimizing compilers
- Performance analysis tools with expert system capabilities
- Advanced program development tools
- Efficient, asynchronous I/O
- High-performance libraries
- Industry standard visual interfaces

#### Networking

- Full connectivity to UNIX and proprietary networks
- Network security features (Kerberos, RIPS0, CIPSO)

#### Data storage management

- Automatic hierarchical storage manager (DMF)
- Tape volume management system
- Online tape support
- STK and ER90 support
- File system extensions
- Disk striping



### Breaking technology barriers

Unprecedented levels of component integration enable the CRAY C90 systems to run at a frequency of 240 MHz. To maximize reliability and signal integrity at this high frequency, CRAY C90 systems use the following innovative technologies:

Figure 1. Custom high-speed 10,000 gate array circuits increase reliability and reduce manufacturing costs with four times the level of integration of previous devices. Gold-to-gold thermo-sonic bonding techniques are used to mount components on printed circuit boards.

Figure 2. CRAY C90 systems use 22-layer circuit boards with internal pathways to prevent contaminants from corrupting signal integrity.

Figure 3. Innovative liquid cooling and cold plates are used to channel heat away from system modules.

Figure 4. Flex circuits connect printed circuit boards to other parts of the system, eliminating the need for large clusters of wiring.

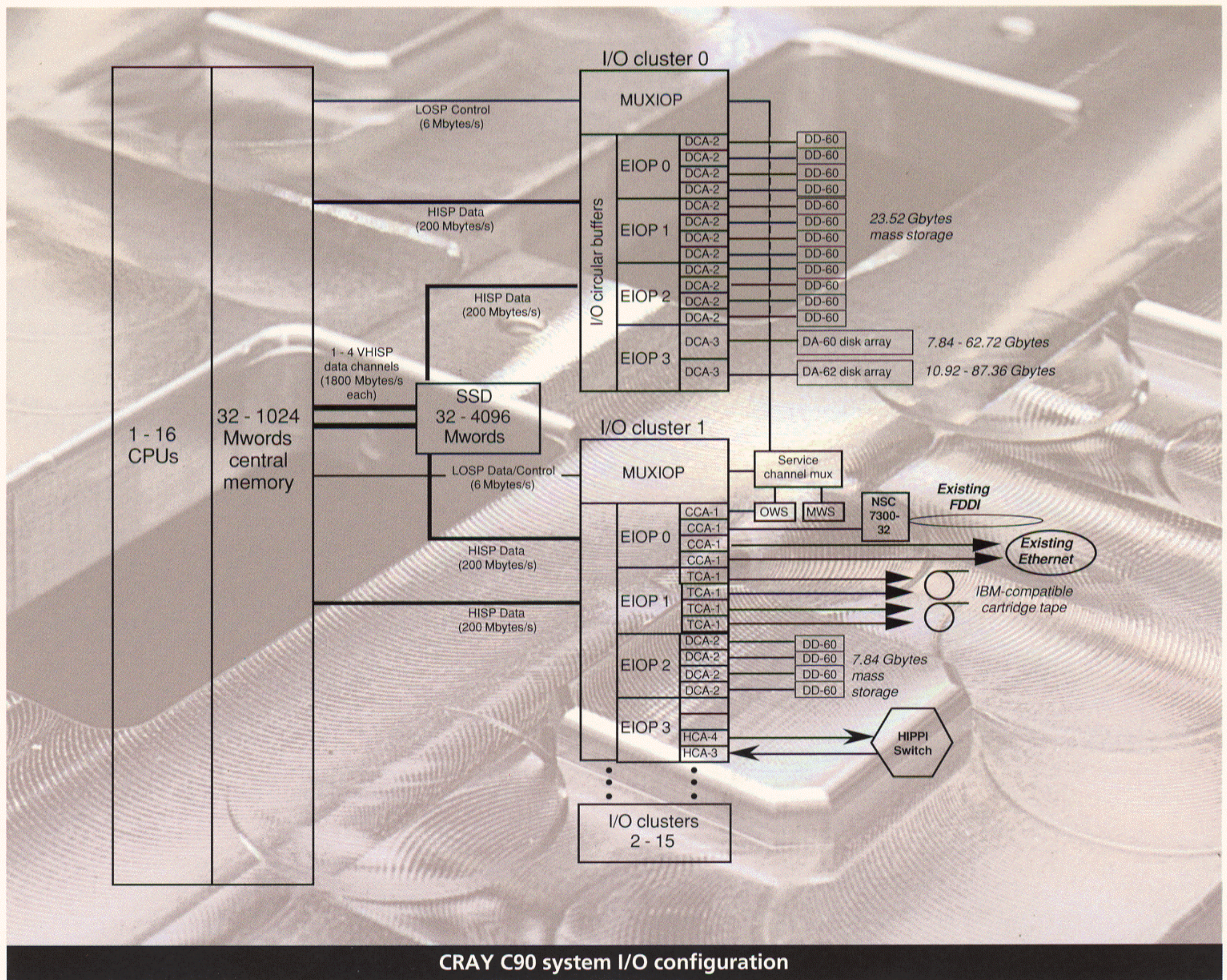
## Powerful I/O capabilities

CRAY C90 systems feature flexible, high-bandwidth I/O subsystems with up to 16 I/O clusters (IOCs). Each IOC supports up to 16 channel adapters for a total of 256 channels for connection to disk storage units, tape units, and networks.

The I/O capabilities of CRAY C90 systems are enhanced further with powerful I/O software that provides exceptional throughput automatically. This software also provides simple-to-use options for reducing I/O transfers and attaining peak disk and tape transfer rates.

## Proven networking capabilities

CRAY C90 systems can be integrated easily into heterogeneous environments. To deliver real supercomputer power to the desktop, all Cray Research supercomputers support industry standards as well as a variety of language extensions, network protocols, and utilities from other vendors.



**CRAY C90 system I/O configuration**

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