Stepping toward mix-and-match computation

One computer by itself — even the most powerful supercomputer available — just isn't enough to solve the kinds of problems on which many researchers now work. A simulation detailing the formation of clusters of galaxies, for example, requires not only a fast computer with a vast memory, but also additional, specialized computers and software for handling and displaying the huge volumes of data that result. And sharing those findings with other scientists requires additional resources.

In the same way, one supercomputing center by itself can no longer fully satisfy the rapidly burgeoning demands of researchers. To formalize a trend already evident, the directors of the four supercomputing centers established by the National Science Foundation in 1985 last week announced the formation of a national MetaCenter as an initial step toward integrating computational resources.

"From a historical point of view, the centers' declaration of their intention to unify their resources to this degree is very important and very promising for the computational science community," says Malvin H. Kalos, director of the Cornell Theory Center in Ithaca, N.Y.

Nonetheless, he adds, "It's important to realize that the MetaCenter is not a new institution. We do not have an organizational structure or charter, but we are working together."

Technical staffs at the four supercomputing centers have already started cooperating on several projects, including the creation of a national system of computer files. Based on the Andrew scheme initially developed at Carnegie Mellon University in Pittsburgh, this electronic filing cabinet would give users a standard set of commands for creating, storing, and retrieving files and carrying out other tasks on all computer systems at all four centers. Another effort involves developing a national archive for such files.

MetaCenter proponents envision these initial stages evolving into an integrated system of software and computers that eventually would look to the user like a single, extremely powerful, multitalented computer. Researchers sitting at their own office terminals would have access to whatever resources are needed to run a particular computer program, and the system would automatically move either the entire program or parts of it directly to the appropriate type of computer, regardless of the computer's or user's location.

Accomplishing such a goal, however, requires overcoming a variety of barriers, including the limited capacity of communications lines now linking computers at the national supercomputing centers. Moreover, getting different types of computers to work together without glitches remains a formidable task. That problem is compounded by the unsatisfactory reliability of some of the newer, more advanced machines now being introduced to the centers.

"I don't think we're declaring the MetaCenter solves all our problems," Kalos says. But working together, "we can press our vendors to do what they can to make their machines more reliable."

Each supercomputing center in the new partnership has several experiments under way to explore means of improving collaboration between centers and among users. For example, the San Diego Supercomputer Center has been involved in the development of a prototype Microscopist's Workstation, which enables a scientist to control a powerful electron microscope housed at the University of California, San Diego, from any location equipped with a high-speed communications link to the microscopy center.

As demonstrated at Supercomputing '92, held last week in Minneapolis, special software gives the user immediate access to three-dimensional, animated, or stereo images of biological material viewed under the microscope.

By sharing the experience gained from such projects and embarking on joint ventures through a national MetaCenter, the national supercomputing centers hope to push technology in ways that individual centers cannot. *— I. Peterson*

Nature joins nurture to boost divorce risk

Increasing social acceptance of marital breakups over the past century has helped spur an increase in the U.S. divorce rate from near zero to roughly one in two couples who exchange vows. Nevertheless, a new study indicates that people who split from their spouses often carry a genetic risk for such behavior — perhaps an inherited tendency toward impulsiveness or some other personality characteristic — that operates in collaboration with family experiences and cultural attitudes toward divorce.

"Genetic factors, such as temperament, help to determine the kind of experiences a developing child has and seeks out, and [they] eventually influence many real-world behaviors, including divorce," asserts David T. Lykken of the University of Minnesota in Minneapolis.

Lykken and University of Minnesota colleague Matt McGue, both psychologists, present their findings in the November PSYCHOLOGICAL SCIENCE.

The researchers obtained self-reported marital histories from 1,516 same-sex twin pairs born in Minnesota between 1936 and 1955. Slightly more fraternal twins (who share, on average, half the same genes) than identical twins (who share essentially all the same genes) responded to the survey. Of the twin pairs, 953 were women and 563 men.

Participants not only reported their own marriages and divorces, but offered what they knew about those of their parents and their spouses' parents.

Divorce occurred substantially more often among both identical twins than among both fraternal twins, Lykken and McGue maintain. This finding held for men and women, twins younger and older than 40 years, and twins whose parents both had been and had not been divorced.

However, the risk of divorce for a participant rose significantly if his or her parents or spouse's parents had divorced. If both sets of parents had divorced, the risk of divorce doubled over that calculated when one set had split up.

Previous studies have considered the family background of only one divorced spouse, thus underestimating the extent to which divorce serves as an ironic tie that binds generations, the researchers note. Both spouses may bring inherited characteristics to a marriage that foster its dissolution, they argue.

The findings also suggest that adjustment difficulties for the children of divorced parents may appear only among offspring who both inherit personality tendencies linked to divorce and suffer significant environmental disruption, such as intense conflict between parents or economic hardship in a one-parent family, according to the scientists. Researchers have noted that parental conflict before and after divorce boosts the rate of behavioral and academic problems among many children, but some youngsters display great resilience in such volatile family situations (SN: 6/8/91, p.357).

"[Lykken and McGue] have done a service and posed a challenge to people like myself who study divorce," says psychologist Robert E. Emery of the University of Virginia in Charlottesville. "Genetic factors seem to play a role in divorce."

But the inherited mechanism that underlies divorce remains unknown, Emery notes. In an ongoing analysis of more than 5,000 women, Emery plans to see whether "antisocial" behavior during adolescence, such as heavy drug use and frequent sexual intercourse, occurred among those most likely to divorce later. Twin and adoption studies have suggested that genes influence such behavior.

Lykken and McGue are currently examining data on values and attitudes among participants in their study to obtain clues to possible inherited personality factors contributing to divorce.

"This research makes a lot of social scientists very nervous," Lykken says. "But knowing an individual's genetic potential for divorce will allow for more effective intervention efforts with couples and their children." *— B. Bower*