Computers

Ivars Peterson reports from New York at the annual conference of the Association for Computing Machinery

Computer chess for fun and profit

Compared with the intensely serious tone typical of chess tournaments featuring top human players, last week's world computer chess championship was a lively affair full of surprises (SN: 10/29/83, p. 276). When defending champion Belle, a portable machine whose chess-playing ability is largely built into electronic circuits and chips, lost to NUCHESS and then to CRAY BLITZ, several observers were ready to attribute its unexpectedly poor showing to an "electronic concussion" Belle may have suffered in a car accident shortly before the tournament.

Another chess machine, BEBE, with its crowd-pleasing array of flashing lights, snagged second place by defeating NUCHESS in the final round. BEBE's designer, Tony Scherzer of Sys-10, Inc., Hoffman Estates, Ill., was one of several programmers present whose computers played much better chess than they did. These programmers found it hard to tell whether a puzzling computer move was a subtle piece of brilliant strategy or a programming error. On the other hand, others, like Hans Berliner (a former world correspondence chess champion) of Carnegie-Mellon University in Pittsburgh, could only watch in horror and frustration when their programs blundered into fatal errors or threw away obvious opportunities.

One very interested observer was the Soviet Union's Mikhail Botvinnik, world chess champion for most of the period from 1948 to 1963 and now developing a computer chess program, PIONEER. Botvinnik promised to return in three years for the next world tournament, but this time as a participant rather than as a tournament guest. Meanwhile, Robert Hyatt, Albert Gower and Harry Nelson, the team that created CRAY BLITZ, the new world computer chess champion, are hoping to arrange by the end of the year a match with David Levy, an international master chess player. At stake is a bet involving several thousand dollars.

Scoring with a musical printout

Transforming a composer's musical ideas into a score on a printed page is a difficult process to automate. Even today, most music is hand-copied because musical notation must conform to complex aesthetic rules that ensure that performers can read the music quickly and correctly. Now, at least one company is offering an automated printing system that converts a keyboard performance on a digital synthesizer into sheets of music ready for a stage performance, sometimes within minutes. The resulting printed scores not only show the correct notes but also look beautiful because aesthetic requirements are met. For example, notes are vertically aligned and flags that join notes are correctly placed.

The music-copying system consists of a small, portable digital synthesizer, which can record 16 simultaneous tracks of music in its computer memory, a graphics display terminal and a dot-matrix printer. To transfer music in digital form to the computer, the composer simply plays the synthesizer. After specifying a few initial parameters, like the clef, key and time signature, the composer sees a page of music displayed on a video screen. At that point, he or she can have the score printed out as it appears or can edit the score to correct mistakes and to refine its appearance so that it conforms to the composer's personal specifications. In either case, a printed score is quickly available.

Alan D. Talbot of the New England Digital Corp. in White River Junction, Vt., who wrote the computer software for the system, says the system helps bridge the gap between the composer and the musician. Composers like jazz pianist Oscar Peterson are already using early versions of the system. However, Talbot notes, the computer program is not complete yet. He hopes to improve the quality of the unedited output and to increase the flexibility of the editing process. In the end, Talbot says, a lot more people will get the chance to write music and experts will be able to do it faster.

Space Sciences

Jonathan Eberhart reports from the meeting of the American Astronomical Society's Division for Planetary Sciences in Ithaca, N.Y.

Io: Signs of snow

That Jupiter's satellite Io even *has* active volcanoes is remarkable enough, made more so by the fact that some of their eruptions are far more powerful than any on earth. But Io is known for so many other bizarre phenomena as well that perhaps it is not too surprising to find that its volcanoes apparently also double as snow-making machines.

The possibility was raised shortly after the volcanoes were discovered in photos taken by the Voyager 1 spacecraft in March of 1979. The principal gas driving the eruptions was concluded to be sulfur dioxide (SO_2), filling the role played by water in terrestrial volcanoes, and researchers noted that it might readily condense and freeze when spewed forth into Io's frigid environment. Other evidence came from what appeared to be frosty patches on the surface, near but beyond the hot immediate surroundings of some volcanic vents.

Now a group of astronomers has reported what they believe to be signs of such an Ionian snowfall, or perhaps ice fog, actually in progress.

On Aug. 2, using the 3.8-meter United Kingdom Infrared Telescope (UKIRT) in Hawaii, fitted with a specially developed spectrometer capable of recording seven spectral channels simultaneously, the researchers observed Io while it was in Jupiter's shadow. This meant that the IR emissions reaching the instrument were not reflected sunlight, but Io's own surface heat. In the spectrum, according to Robert R. Howell and Dale P. Cruikshank of the University of Hawaii's Institute for Astronomy in Honolulu, and T. R. Geballe of UKIRT, was a deep "absorption feature" at a wavelength of 4.07 microns, meaning that something was absorbing the 4.07-micron emissions before they reached the telescope. Past studies have found this feature to be part of the spectrum of SO_2 ice or frost (but not gas), says Cruikshank, yet it could not be due to a surface deposit, since the hot surface that produced the IR emissions in the first place would also have kept the SO_2 from freezing. Instead, the researchers conclude, the absorption must be due to SO_2 that erupted from Io as a gas, then froze overhead into "solid particles or flakes"—snow (or some other icy form) from a volcano.

The resulting cloud of particles was presumably a huge one. To produce such a deep spectral absorption feature, the scientists believe, the thermal emissions must have been coming from "at most a few hotspots associated with [erupting] plumes, rather than from many weaker sources distributed over [Io's] disk." The most prominent of Io's hotspots is known as Loki, which appeared in the Voyager photos to be about 120 miles across. It was facing the earth during the Aug. 2 observations, and although plumes were not necessarily erupting from its entire area when the spectrum was taken, the emerging SO_2 is thought likely to have expanded enough for the cloud to form over an even larger expanse.

Io: Watching the oven

Io's huge volcanic hotspot Loki, besides apparently enabling the detection of the "snow" reported above, seems not to be an on-and-off affair, but to have remained active throughout the four years since its discovery, according to Torrence V. Johnson and colleagues from Jet Propulsion Laboratory in Pasadena, Calif., and the University of Hawaii. Extended observations with the 3-meter NASA Infrared Telescope Facility on Hawaii's Mauna Kea have enabled researchers to conclude, in fact, that the bulk of Io's thermal emission arises from "a very few localized sources—possibly as few as two," one of which includes Loki's vicinity. Also, Johnson reports, the data indicate that Loki's IR emission has not only kept going, but increased by about 50 percent since Voyager. If most of Io's heat emerges from these few spots, however, the total amount may be barely half of previous estimates.