together invoices from information on orders and prices. All the necessary procedures are represented on a video display and can be easily modified and manipulated to construct the required form. Zloof is now developing a "Database-by-example" that uses a similar visual form to retrieve information from computer files.
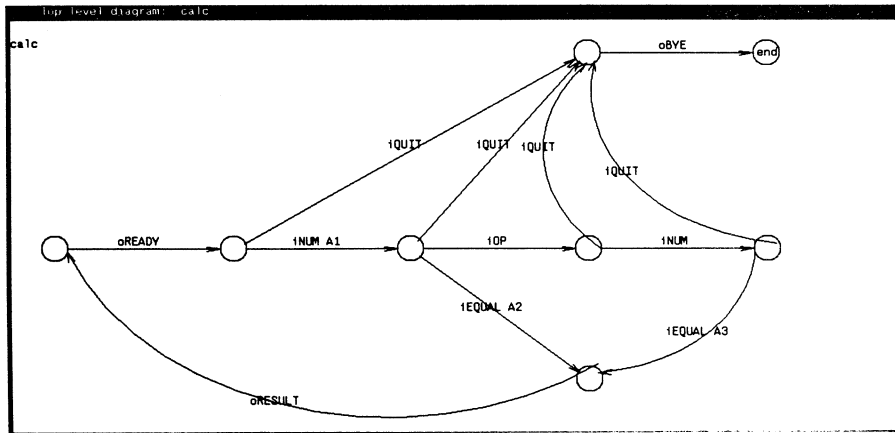
This visual approach gets complicated, however, when a single picture can't tell the whole story. "You can easily lose track of what you're doing," says Zloof. There may be limits to how cluttered a single picture can get and to how many different pictures a person can handle.

This "state transition diagram" describes how a simple desk calculator works. Starting at the circle farthest to the left, the diagram illustrates the choices at every step in performing a simple computation like adding together two numbers.

Margaret A. Khorfhage of Trammel Crow Co. in Dallas argues that stylized pictures take time to read and grasp. People have to be taught to understand the symbols, she says. Although good "icons" can sometimes be created for nouns, other parts of speech, like verbs, tend to lose out.

Khorfhage wonders how much of the current surge of interest in visual languages is just a fad. "Can we communicate effectively without a visual language?" she asks.

"It's not a fad," says Adarsh K. Arora of the Gould Research Center in Rolling Meadows, Ill. He points to the increasing use of computer-aided design, spreadsheet programs, windows and other visual aids to help users get what they need out of a computer. All of these may be considered primitive visual programming languages, he says.

Arora suggests that animation may eventually be used to show how objects, as designed on a computer, would work.

Visually following flows through a "data structure" or program to see how it behaves could make it easier to track down errors.

"Visual languages are here," says Jacob, "but they have a long way to go. In the long run, a theoretical understanding of visual perception is needed." This would let designers devise more effective graphic symbols for their particular picture programs. □

Causal chain challenged

In "Guns or babies?" (SN: 7/20/85, p. 40) a strong favoritism is given to one particular causal explanation of a correlation. While it is likely that this favoritism accurately reports the orientation of whoever was interviewed for the article, I suspect SCIENCE NEWS might concern itself a bit more with alternatives, in the name of objectivity.

When a correlation between two factors is detected, assuming the correlation is not accidental, there can exist one or more of three causal relationships: A causes B, B causes A, and/or A and B are both caused by C. In the recent article, attention was paid to the idea that increased military spending reduces social services funding so that health care or other correlates with low infant mortality suffer (A causes B), and the death rate rises. No alternatives to this causal chain were mentioned or proposed.

If we look for a reversal of this hypothetical causal chain (B causes A), we could speculate that in a society with high infant mortality (a lot of parents losing their children, perhaps due to underdevelopment of local medical or sanitation services or prevalent local disease), there may exist a relatively high amount of personal anger, frustration, fear and disillusionment and a general societal belief that life is essentially more hostile than it may be believed to be elsewhere. These emotions and beliefs may result in society-wide attitudes which are manifest in increased attention to military armament.

Looking for an instance of explanation for the third type of causal chain for this correlation (A and B are both caused by C), we might wonder if militarism and infant mortality could both have their roots in an economy of scarcity, which may exist for ecological or historical reasons, and which results in both insufficient health care resources and an overly strong society-wide sense of the need for self-protection (coupled with genuine fear on the part of the rulership).

For each of these possibilities, the solutions sought in order to improve the situation would be different.

Laurie Spiegel
New York, N.Y.

Alternatives to animal experiments

It is encouraging to hear of the National Academy of Sciences' recommendation to seek alternatives for laboratory animals in experimentation ("Routing out phylogenetic bias," SN: 5/18/85, p. 312). It is not an entirely new idea, though. Sen. Dole (R-Kans.) introduced a bill in early 1984 which, along with its companion bill, called for an amendment to the Animal Welfare Act. Included within the bill were findings that different methods of testing existed, as did the capacity for a data base that would minimize unnecessary duplication of experiments on animals. The bill has been stagnant for close to a year, so it was good to see an interest in the matter again.

However, I became discouraged when I read of a National Research Council report ("Medicine capsules," SN: 6/1/85, p. 345) calling for the opening of a research center to study the effects of deliberate and accidental injuries due to motor vehicle accidents, firearms, jumps, etc. Note: to study, not treat injuries. This implies that wounds would be inflicted upon animals simply to observe — a practice that does take place.

Wouldn't the more logical solution be to focus on these injuries before they occur?

Gregory C. McKinney
Philadelphia, Pa.

WIMPS aren't the bullies

WIMPS (Weakly Interacting Massive Particles) are the cause for the lack of neutrinos emanating from the sun's core, suggest Faulkner and Gilliand (SN: 7/13/85, p. 23).

Recently, Raymond Davis of Brookhaven National Laboratory has presented data that suggest that the sun's neutrino counts vary inversely with the sunspot cycle. Sunspots occur on the sun's visible surface while neutrinos, which are not affected by the magnetic fields of sunspots, supposedly come from the sun's core. Any viable solar theory must explain the dynamic relationship between sunspots and the neutrino count, which the WIMP theory does not.

Stephen Goodfellow
Detroit, Mich.

Afraid I couldn't resist the enclosed thought after reading "Weak sun blamed on WIMPS." Please forgive my irreverence.

Joan Hensley
Bloomington, Ind.

COMPANION TO THE "QUARK" BEING CALLED UP ON THE "SQUARK BOX"