Last month we sat in a room with 2000 people convinced they will take over the world. They had been physicists, neurologists, philosophers, engineers, computer scientists, psychologists, mathematicians. And now they are, one way or another, neural networkers. This was the "First International Conference on Neural Networks." When a new industry attracts 2000 people to its first public event, there's likely to be some premature excitement, and so it was in this case. Few of the 20-odd exhibitors had products to show.

The concept of simulating the brain's neural structures is not new; there's a substantial body of learned papers on the topic dating back to the Fifties or earlier, depending on the broadness of your definition. Like rule-based expert systems only more so, computer simulations of neural nets required too much computing power to be practical until now. With the advent of cheap memory and cheap processing power, to say nothing of parallel architectures, neural nets are coming into their own, and catching the attention of such serious-minded outfits as Morgan Stanley, the CIA, and the Defense Department. The floor at ICNN was crawling with financial types -- both VCs and potential users. Nestor, a leader in the business, numbers a mortgage banker and an insurance company among its customers, and has $6 million in funding from Saul Steinberg's Reliance Group.

As people discover for better or worse that "AI" is just a new approach to problem-solving and a new set of programming techniques, with systems doing exactly what you tell them (if blindingly fast and in seemingly arbitrary order), the appeal of neural nets lies in their ability to learn -- not just to fire canned rules, but actually to learn from experience, just like people.

The corollary, of course, is that the knowledge in neural nets is inexplicit: You can't ask them how they know; you can just assess their answers or ask how they were trained.
Expert systems still work best when the rules are explicit (e.g., corporate policies) and when a system's value depends on its ability to comment on its reasoning (as in training people). In short, while expert systems have in-spectable rules and applications have specs, neural nets have only resumes.¹

No, neural nets won't conquer the world overnight, but they are likely to gain critical mass as a technology far sooner than anyone but those involved would imagine. Unlike conventionally programmed systems, working neural net systems can be built with extraordinary rapidity, and their applicability to problems such as robotics and speech and handwriting recognition is immediately apparent. More intriguing is their use in credit evaluation and other risk assessment tasks, forecasting of any kind, and any area where desired behavior is more easily shown by example than rigorously described (where an expert system would be appropriate).

Take one of the best-known examples: Terrence Sejnowski's NETtalk. (Like expert systems until recently, there are only a few well-known cases which are cited over and over; remember Aldo Cimino and his soup cooker?) It took Sejnowski, a professor at Johns Hopkins, only 16 hours to train a system to produce intelligible digitized speech from text, working with a 400-node system. DEC has a similar system, DECtalk, with thousands of pronunciation rules and exceptions, developed over a period of six months on a VAX -- on the basis of 20 years of research into speech patterns.

The trick is to pick the right "blank" net or build a new one, tweak it correctly (for learning style: fast or slow, stubborn or flexible, cautious or venturesome), "pre-process" the data it will handle (analogue to digital, text-based forms to structured text fields -- or do you want to consider an applicant's handwriting?), and train it with the right facts or scenarios.

How do they work?

While it takes a neural net to define the knowledge a neural net learns, the underlying neural network structures are rigorously mathematical. Indeed, there are 10 or more widely accepted architectures/algorithms, of which Hecht-Nielsen, for one, sells five on a standard basis.

In essence, while expert systems use the kind of logic that might appear in an instruction manual or rule book, neural networks are models of the brain, and attempt to build the kind of "knowledge" used by an experienced person operating in a familiar situation (more on this below). Current belief gives the typical brain 10 billion neurons capable of operating simultaneously, albeit slowly by electronic standards (10 hertz). As our brains are active -- thinking or reacting subconsciously -- these neurons send impulses to one another over some 2 to 3 trillion interconnections. Whether that's all that it's about is unclear, but it's certainly a start.

¹After years of resisting the temptation to anthropomorphize, we have finally found a topic where it's appropriate! It's fun to look at oneself through the neural net prism. For example, consider how difficult it can be to recognize a business colleague out of context at the beach; you're looking for the wrong set of matches.
Neural nets are a simulation of that process, where the "intelligence" lies in the joint decisions of hundreds or thousands of neurons on how to react to signals from other neurons. Each decision is binary -- a weighted set of stimuli (signals from other neurons) causes the neuron either to fire or not to fire -- but the cascading of those reactions creates an overall pattern that is not at all binary. It's the overall pattern and the flow from one neuron to another, not the "content" of a particular neuron, that counts. Remember that thought is not a state; it's an activity. And the old name for neural net nuts is "connectionists."

The simulated neurons, much like real ones, assign a weight to each input they receive; the sum of the weighted signals determines whether a receiving neuron will itself fire a pulse, which in turn triggers other neurons. This process cascades through many iterations, and the result, the output, could be "yes or no" to a single question: "Should we grant this guy credit? Should we push the button?" Or it could be several responses to many questions: "Is it yellow? Is it red? Is it a bird? Is it a plane?" with the ultimate result of a rich, detailed response -- It's Superman!

How are the weights determined? Basically, you could build them yourself (which is essentially what building a rule-based system is about) or you can give the system inputs and corresponding outputs, and let it adjust itself until it consistently gets the right answers. It adjusts itself by way of differential equations that combine stimuli and feedback from the responses to adjust the weights so as to get increasingly correct responses.

Here is the catch. Yes, neural networks are self-programming; they can "learn by themselves," as the ads will no doubt claim. Yes, the results are more than you could ever hope to achieve with "mere" programming, or with explicit rules, but that doesn't mean there's no work. Even after someone has built the learning system, the neural net itself, the user (or reseller) must develop the "training materials," properly configure the input and output data, and hook the system up to its environment -- other computers, input devices, pc screens. These seemingly trivial problems -- managing the training, data pre-processing, and systems integration -- will remain a challenge for users and an opportunity for entrepreneurs even as engineers build cheaper and more powerful neural net software and enabling hardware.

Learning algorithms

As you might discern, the mathematics of the systems' weights is complex. How are the weights to be summed? How frequently and by how much should they be adjusted? Each time the system gets a wrong answer, or only after a series of tries on different inputs? The system should adjust, but not over-adjust. How can you make it insensitive to "noise," or erroneous data (just as Juan is not deceived by a pimple on the face of his beloved Alice)? How is feedback integrated into the system? How is missing data searched for? How are the signals propagated through the network? How many layers and how many nodes should it have?

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2In fact, one of the most endearing concepts in the field is the "grandmother" cell, the single neuron that is ultimately triggered by the multitude of neurons triggered by the pattern that forms the face of your grandmother. However, most people believe that each concept or object, such as grandmother, itself exists only across a specific group of neurons.
All these problems are addressed by the specifics of the equations used, which we will not address further here. Suffice it to say that in general the more nodes the better, since they are all binary and each connection provides only a little piece of information. The power is in the pattern. Layers or "slabs" of neurons act as cross-checks and funnel and fan pattern information through a hierarchy. In simple terms, for example, a neural net recognizing an A might first notices edges, then angles, then the particular arrangement of angles that forms an "A."

The choice of algorithm can affect the speed with which a system learns, its venturesomeness (its propensity to make wild guesses), its reaction to mistakes, its stubbornness in the face of contradictory examples, etc. If all this sounds very anthropomorphic, so be it. Some people are slow to make up their minds and slow to change them; others are fickle and uncommitted; some just don't seem to have very many fresh nodes, to put it politely. All these traits can be mimicked (implemented?) by neural nets.

What's to ensure that the system reaches a right answer? Perhaps nothing. What is a right answer? The thing on the right, is it a 2 or a Z? If it's in the middle of the sequence 1-- 3, we'll guess it's a 2. If it's in the middle of CRA Y EDDIE, we'll guess it's a Z. If it's on a check addressed to us for $ 00, maybe we can read it as a 3 or even as a 7.

Training

An analogy: A six-year-old child may be incredibly bright and able to learn, but you still send him to school. Part of what he will learn over the next twelve to twenty years will be grown-up behavior and judgment; part will be explicit facts, rules, and other information. Only then (if ever) will he be ready to make people judgments, cure the sick, manage a division, work as a secretary, or develop an ad campaign. (A little earlier, needing less judgment, he'll probably be able to operate effectively as a short-order cook, a car mechanic, or a newspaper delivery person.)

Likewise, the quality of judgments a neural net makes ultimately depends on the quality of the information it's trained on. Just as a person can be misled by a misunderstanding, or generalize too far from a single early experience, so can a neural net. Thus a neural net trainer must have some of the same skills as a teacher, knowing how to devise an appropriate training course with the right sequences to best train the junior neural net.

As noted, in many cases we don't know what's right. A handwriting system, for example, is probably best trained on the handwriting of the person who's using it (a pharmacist, for example, might ask his local physicians for samples). How do you train a credit evaluator? The expert systems installed by American Express get their rules from trained authorizers (see Release 1.0, 4 August 1986); rather than following the experts' decisions, a neural net version might train by matching the data with the ultimate outcomes of the experts' decisions. If neural networks deliver on their promise, they will learn more effectively from experience (in limited domains) than humans and will be able to provide better decisions.

Precisely because neural nets are flexible and "soft," there is no single correct way to train one, nor a single correct set of facts to train them on. If there were, why bother with the neural net?

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Pre-processing

Once the neural net is trained, it still needs to receive data in appropriate form. Light waves from objects on an assembly line must be collected by a sensor; credit application forms must be read and coded; handwriting must be digitized and transformed into some computer-readable format (but see below, on analogue systems). Obviously, the system notices only the information you give it; for example, if you describe a letter as vectors without regard to size, the system won't be sensitive to the size of the letters. If you leave out the sex of an individual, it won't factor that into its deliberations (although it may end up looking sex-discriminatory anyway). At that point, a lender or other discriminator could elect to counter the sex- or race-linked bias as a matter of social policy -- but it would do so knowingly. You could also compare both the impact on selections and the predictive ability of a trait such as sex, race, or Zip code (cf. bank redlining of "undesirable" areas).

The structure of the data that is fed in obviously has an impact on what is ultimately read out, and may reflect a conscious or unconscious bias on the part of the preparer. What factors does the system even get to consider?

Pre- and post-processing also involves the nasty old dp tasks: file conversion, integration with the rest of a dp environment, and front-ends both for data entry and for reporting answers. The output of a neural net must be converted into useful form -- synthesized voice, commands to drive an application, facts to fire rules in an expert system, data to fill a data base. Like most other technologies, neural net systems will most frequently be used as components of larger systems.

Where neural nets fit

To oversimplify, we would describe it thus: Neural nets figure out what is. Expert systems figure out what to do about it. And applications do it.

That is, neural net systems are not useful for actually doing things, but they can be useful in defining situations that will trigger expert systems' rules or applications' actions. For example, a neural net might determine that a particular investment had reached its peak and others looked attractive. An expert system could then lay out the appropriate response depending on the investor's risk-reward preferences and cash-flow constraints. And an application might then generate the paperwork for the sale of the ski hut and the purchase of a small software company.

The best way to define the difference in appropriateness of expert systems vs. neural nets is where you can learn by experience, and where you can learn by reading the proper manuals and following the rules. For example, detecting malice or the identity of a blurred figure in a photograph or a forgery might be a job for a neural net, while determining applicable law would be a job for an expert system. For the moment, expert systems are often used for tasks for which neural nets might be more appropriate. Neural nets deal with rich situations that can be reduced to a concept, whether "X" is true, whereas expert systems handle best complex but explicit situations with many if-X then-Y rules. (Linear regression is also used in some cases where neural nets might be more appropriate, especially where data are lumpy and hard to quantify, and factors are numerous and non-linear.)
Obvious applications are evaluations, predictions, and speech and writing recognition. The most compelling demos are those showing handwriting recognition, since they are at once simple and powerful. Nestor's NestorWriter, for example, can learn to recognize letters as you draw them in (using a lightpen on a Toshiba 3100). Just out of ornerness, we drew several Gs and told the system that they were Ts; after a while it caught on. Say it's so, NestorWriter! A similar system (displayed only as a demo) in the Hecht-Nielsen booth wasn't as robust, but it did considerably better than your average PC.

Neural nets and natural language

One of the more interesting implications of neural net technology long-term will be in the area of natural language. There are already neural net systems such as NETtalk that can read aloud, but with no understanding, by looking at letters in context. That is, after learning "tough" and "rough" such a system might learn the exception "through," and then the exceptions "bough," "bought," "thought," "though," and "cough." Or it might learn the same knowledge in another order, just as a person might, and have a different understanding of which are rules and which are "exceptions." But to read, say, "read" or "lead," it would need to know more than just letters. In the sentence, "They read the book," for example, you'd need to look at the surrounding sentences to get the meaning and thence the pronunciation -- and you still might not know for sure.

So how do neural nets fit in with natural language? We're not sure -- but we do know that people learn language mostly by listening and speaking, not by reading dictionaries or grammar texts. Of course, there is no one way to do it: Contrast the Berlitz total-immersion approach with the traditional recite-the-declensions approach (and consider which one is now generally believed superior). It's clear that neural net technology combined with a lot of explicit knowledge of the sort currently fed to natural language systems (synonyms, tables, parsing, etc.) is likely to prove far more productive than either approach applied alone.

Neural nets and digital signal processing

What we now call neural nets have been around for some time in the form of digital signal processors, which take a signal and compensate for distortions. Indeed, inside every modem there's a full-scale neural net. Does this mean that Hayes is the next big player in neural networks? Not quite, given that the neural nets in modems are hard-wired and, as noted above, it's the ancillary value-added, not just the neural net itself, that will distinguish neural net players in the long run.

But the "signal" as opposed to "symbol" mindset does inform the field as a whole. "It's the engineers' revenge on dp," one neural-netter suggested to us. DP folk tend to like analytical thinking and logic, antithetical to the neural net mind, which basically says, "Trust me" ...and save yourself the work of being explicit.

Elsewhere, there's rivalry with the artificial intelligence (symbolic) community, which feels threatened by this new technology. Perhaps when expert systems are appropriately recognized for what they are -- a new approach to programming -- this tension will resolve itself, and all kinds of AI companies will get busy worrying about applications rather than technology.
THE PLAYERS

"I used to think I had to have more rules than the next guy. But now I know it's really the nodes that count." -- Juan talking to Alice

NESTOR

Nestor, based in Providence, RI, is the oldest of the neural net companies. Founded as Nestor Associates in 1975 by physicists Leon Cooper (a Nobel winner) and Charles Elbaum of Brown University, Nestor has a very close-mouthed reputation, and keeps tight control of its technology. It has never revealed its algorithms even to its marketing partners, but this past spring it started selling development tools in addition to its NestorWriter handwriting recognizer (list: $1595 and up; runs on a PC). The tools include Decision Learning System (in beta for a mortgage underwriting system) on ATs, Suns, Apollos or mainframes; Nestor Development System, $25,000, on a Sun or Apollo; Character Learning System, or CLS, a software package for reading such things as bank checks online; and the Image Learning System. Generally, prices are negotiable.

Although the slight air of mystery may hurt it in the long run, Nestor seems to have something worth protecting. The company is in the uncomfortable position of being "almost there" with a large number of projects at commercial sites, although its most ambitious project -- a character recognizer that could recognize 2700 hand-written Kanji characters -- foundered when marketing partner DEC changed its mind. A French insurance company has purchased ten NestorWriters for use in data entry, but hasn't yet put in a production order. Meanwhile, Nestor is working with several financial outfits on problems such as mortgage origination and underwriting. At last report, the company was losing money, but it has $6 million in the bank and an array of offerings that may be just about to catch on.

HECHT-NIELSEN

If Nestor is the oldest neural net company around, how come Hecht-Nielsen gets the TV coverage? Perhaps because life isn't fair, perhaps because Hecht-Nielsen has a PR agent, perhaps because Robert Hecht-Nielsen himself is a central-casting engineer-entrepreneur who says of the neural-net community, "We have more beef than anybody." Tall, solid and oddly approachable in his tennis shoes, Hecht-Nielsen started his company only nine months ago, after three years developing neural net systems for TRW, one model of which is currently on the market; the other belongs to the government.

San Diego-based Hecht-Nielsen is aiming at a mass market, with a 68020-based add-in card, the Anza, optimized for neural net processing and selling for $9500; versions with a Zenith PC go for $15,000 or $19,000. Unlike Nestor, Hecht-Nielsen is open about the algorithms it uses, and offers its system with five varieties: back-propagation, counterpropagation, adaptive resonance, associative memory (Hopfield/BAM), and spatio-temporal (formal Avalanche). The Anza is named for Juan Bautista de Anza, as in De Anza Boulevard in Cupertino, who explored California in 1774 in the service of the Spanish king. It also has resonances (triggers associative memory??) with the frequently heard acronym ANS, for advanced neural system.

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The Anza is programmed with Axon, a language Hecht-Nielsen is hoping to make into an industry standard, and works with UISL (pronounced "weasel"), a user interface subroutine library. It has up to 30,000 processing nodes with 480,000 possible connections.

Hecht-Nielsen himself wants to succeed in a big way and bring the industry with him. He has hired his old boss from TRW, Robert North, to help. As president and chief operating officer, North is busy lining up strategic alliances with larger partners who have application-specific and marketing expertise. Hecht-Nielsen's big business right now, in fact, is spreading the word through its training courses, which draw heavily on the neural net infrastructure of people, professors and companies in the San Diego area. Twelve people have already undergone the four-week version, which costs as much as a machine itself ($15,000), and are waiting for their beta systems to be replaced with production models available this week.

SYNAPTICS

Five-man Synaptics is the dark horse of the neural net race. Founded by neurobiologist Gary Lynch and semiconductor industry legend Federico Faggin and run by Faggin, Synaptics is looking at building neural nets with analogue rather than digital technology (like our brains!). Synaptics chairman Carver Mead, the silicon compiler visionary, eloquently stated his case in a splendid talk at the ICNN: Given that neural nets look for patterns, not precision, analogue computing will give us sufficient computation of sufficient resolution with far less complexity than digital computers with their differential equations. (In fact, what we have now is digital simulations of an analogue process).

With no product and no prospects of one until the company has resolved some basic issues of design and architecture, Synaptics is an enticing company to watch, if only because of the compelling breadth of Mead's mind and the sterling track record of Faggin, who designed the Intel 4004, the first microprocessor, and went on to found and run Zilog and design the Z80. Synaptics is being watched by, among others, investors Kleiner, Perkins, Caufield & Beyers; Technology Ventures, and Sprout. Says Faggin: "Neural nets aren't for balancing your checkbook." They're for looking at the balance and discovering you're in trouble!

BEHAVHEURISTICS

BehavHeuristics takes the prize for clever names, and for clever demos too. Although the company is leery of getting too specific for fear of attracting too much attention from its competition (notably American Airlines), it showed an impressive demo combining two neural nets, rule-based technology, and a stunning graphical interface. The system, called Airline Marketing Tactician, advises users on airline seat yield-management (Release 1.0, 17 February, in the profile of American's Mike Buckman). It is written in Smalltalk (for ease of programming and richness of interface) and runs on a Tektronix 4406 AI workstation, although it could easily be ported to any other Smalltalk machine.
One neural net operates in perpetual training mode on patterns of seat bookings, pricing, no-show rates, and other vital statistics of the airline business (simulated for now, to be provided by the airline in actual operation). Based on how seats are selling on any given flight, that net predicts demand and no-show rates. A second neural net considers the airline's possible actions, and an expert uses its output to advise the user to raise or lower the number of seats available at each fare in order to maximize revenues and yield and minimize such things as overbookings (especially of first-class passengers!). Obviously, no system yet can predict a mechanical breakdown or the weather (although one paper presented at the conference indicated that a neural net could beat some local weathermen), but AMT could quickly recommend appropriate responses. It can also follow explicit rules and policies concerning bumping, alternate-carrier vouchers, etc.

AMT will allow each flight to get automatically the same scrutiny that in the actual people-short world could be applied to only a few flights at infrequent intervals. Since the system is just in prototype and will be heavily tailored to a customer's needs, there's no pricing. BehavHeuristics generally does custom work; the airline problem is just a good fit for a proof-of-concept product. It has a combination of huge potential financial impact and a lot of data that needs sorting out, says founder Bill Hutchison, a behavioral psychologist with a strong background in math and computers. He started the consulting firm in 1983 with money from the sale of the extra house sold when he and his wife moved in together. Co-president Ken Stephens, also a behavioral psychologist, joined the firm in 1985.

Now read on...

The preceding nine pages were intended more to pique interest than to attempt any rigorous explanation of the workings of neural nets. Although the field went into disfavor in the late Sixites with the perceived failure of the Perceptron -- something of a straw net, for it had only one layer -- it has since come back with the advent of more robust, deeper implementations and the proof of Kolmogorov's Theorem, which in essence states that for each set of inputs there does exist a weighted network pattern that can map it to a given set of outputs. (Unfortunately, it doesn't specify how to build the net in any particular case!) While a period of disappointment will inevitably set in when it's discovered that neural nets can't solve all problems, we believe the technology will find many uses. For further information, you may wish to read the following (if you're up for a challenge):

- **Parallel Distributed Processing**, edited by David Rumelhart and James McClelland, also MIT Press.
- **Self-Organization and Associative Memory**, by Teuvo Kohonen, coming in a revised version this September from Springer-Verlag, (212) 460-1500.

"Anyone can have a lot of nodes. It's the richness of connections between them that impresses me."

-- Alice responding to Juan

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New developments in technology have to be assessed in light of whether they make sense; *advances* in technology *change* what makes sense. SunRiver's announcement of the Cygna 386™ changes our vision of multi-user shared-processor systems, which heretofore made sense only for text applications.

Based on a 32-megabit-per-second (triple Ethernet's speed) fiber-optic connection and some graphics-processing gate array chips, the Cygna 386 lets multiple terminals controlled by a 386 each display graphics of a quality usually requiring a local processor. The Cygna 386 is a delight to all the hypervisor vendors (Locus/Microport with Merge 386; Interactive/Phoenix with VP/ix; et al.; see Release 1.0, 2 December 1986), who can now more fully exploit the 80386's virtual-machine facility for multiple users. Otherwise, the chief value of the hypervisors (just now entering the market) would be to run multiple DOS applications on a single screen for a single user; even text applications run slow on multiple crts because of host-to-terminal overhead. So hypervisors are nice, but they provide mostly convenience, not the tangible cost saving that results from users sharing a 386 and coprocessors (plus about $2000 per Cygna station, including cable and crt).³

Up until now, graphics-rich applications required a chip and a single-user operating system at the user's desk (even if it was UNIX in single-user mode on a 68000 workstation). A general model is that users work within DOS or OS/2 locally, and connect to a number of multi-user services such as dbms or text base management (see Release 1.0, 12 June) on a server. Meanwhile, UNIX is for multi-user text-style applications such as accounting, and for server applications such as data base management.

Now those graphics-based DOS applications can operate from a single 386, and UNIX applications could appropriately incorporate a little more graphics. The graphics-rich UNIX-based applications that do exist typically run in single-user mode on 68000-type workstations; what Cygna 386 means for the Intel 386 in competing for those applications will be interesting to watch.

We're well aware of the tremendous prejudice against shared-processor systems on the part of pc users; we share it. And we suspect that UNIX and the intricacies of sharing a 386 among several users will make our network setup problems look trivial. Moreover, although SunRiver touts the ability of each user on the system to have access to a 386, the power of that access is tempered by the number of other people using it at the same time. We expect the Cygna 386 to garner more interest from people currently selling multi-user transaction-type applications than from builders of OS/2-based workgroup applications. As noted, except in the UNIX mode, the applications on the Cygna 386 are the same old single-user DOS applications, with whatever access to common files and peer-to-peer communications capabilities the configuration allows; Cygna does not support multi-user DOS applications any better than would a network. For that, we need a multi-user operating system -- or multi-user software, not just hardware connectivity. For that, please turn the page...

³Of course, the pricing and configuration of the applications used in this mode remains an issue; in general, any company should have a purchased copy of each application for each electronic copy in use.

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ARCHITECTURE: AN OS FIT FOR SERVERS

While SunRiver makes a case for time-sharing, which will no doubt be heard by traditional applications vendors such as Open Systems (present at the press conference), Microsoft and 3Com have banded together to further the cause of networking and server applications with OS/2 LAN Manager.

What is OS/2 LAN Manager? It’s the combination of server software (OS/2) and network hardware and services (LAN Manager) that will help shift the locus of power from individual workstations to that amorphous location known as the workgroup. What is a server application? It’s what used to be called a multi-user application, except that instead of controlling users’ workstations, the server application deals with them as consenting adults. Individual users manage their own work, and call on the server application as necessary. Although no one controls the whole set-up, the systems janitor (who needs less skill than last year’s systems administrator) uses the server application to set the system up and assign access levels, passwords and the like, and count users for royalty records. OS/2 is fundamental to this arrangement because the program interfaces within OS/2 are the same as those between server applications and cooperating applications at workstations (including DOS 3 ones with limited support), and ultimately between distributed modules of a single OS/2 application (a fine distinction).

By contrast, the current implementation of SunRiver’s Cygna (above) allows multiple users of DOS to operate simultaneously and separately from a single processor, but does not itself offer support for a multi-user application as OS/2 will, or as UNIX already does. In the current architecture, users download applications from the server, and perform the work locally. Files of so-called multi-user DOS-based dbmases may be stored on a server, but the actual processing goes on at the user’s desktop. Each user sets flags on the shared files (dBASE III) or records (Paradox) he’s using, but that’s about the extent of the multi-user capabilities of these applications.

Why does Microsoft need 3Com? LAN Manager is a system product of the kind that Microsoft typically sells through OEMs; if IBM doesn’t sell LAN Manager, which is likely, then Microsoft needs 3Com to reach and support the large IBM installed base. Moreover, the alliance strengthens both 3Com and Microsoft against Novell, which uses proprietary software on its servers and is forming strategic alliances right and left. Novell plans to offer its own version of NetWare to run off an OS/2 server. The third big interest group, IBM, is still undeclared for specific network support. Given that IBM’s PC/PS operating system of choice is OS/2, it’s likely that IBM’s LAN software will support some features of LAN Manager and look the same to station and distributed server applications, just as IBM uses Microsoft’s Redirector in the DOS LAN environment. Both Microsoft and 3Com are vigorously espousing the openness of their offerings, available for license to all. As the history of Ethernet shows, third parties may offer more in support and credibility than they take away in competitive sales.

Ultimately, server (or workgroup) applications will support such tasks as version management and change reconciliation, project coordination, task assignment and monitoring, all of which require complex interaction among people rather than mere check-out and check-in of intact files, as well as plain old large applications. (See many of our recent issues for examples.) Microsoft and 3Com are making a plea to applications developers to get busy in the workgroup applications that will sell networks, OS/2, and 386es.

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ARCHITECTURE: SUN MICRO GOES INTO ORBIT

In a complex world, most high-class companies prefer to compete on features and tone than on sheer performance. Breaking the rules, Sun Microsystems has just announced the Sun-4 (nee Sunrise), the 10-MIPS RISC-based heir to Sun's installed base of 40,000 Sun-2s and -3s. At the announcement, Sun led the press through an almost tedious litany of specs: one-tenth the cost of a VAX 8800, four times the power of an RT PC, 19,000 dhrystones, 1600/1100 Linpack (SP/DP), all for $40,000. (386 machines were beneath mention.)

Further breaking the rules, Sun is cockily urging its chip suppliers -- Fujitsu, Cypress, and Bipolar Integrated Technology -- to sell those chips to others as well -- including future superstation vendors Dana Computer (founded by the Convergent team of Al Michels and Ben Wegbreit) with four MIPS RISC chips and Stellar (Poduska) with its own chip. "We're trying to glue the third world together," says Sun founder Bill Joy. "We'd be delighted to have them on our side. The battle is with IBM and DEC."

So where's Sun's edge? Aside from royalties on chip sales, Sun has a set of compilers and systems software (including UNIX, C, FORTRAN and Smalltalk) that enable a user to move almost painlessly from the old Suns to the new ones -- and the promise of further painless MIPS to come. RISC-architecture systems, being simple, are inherently easy to scale up...and being simple, they require correspondingly complex systems software. Providing such software is no mean challenge, as Hewlett-Packard discovered in its long and tortuous development of the Spectrum machine.

The AI angle

Among the software Sun is providing with the announcement of the Sun-4 is a full Common LISP from Franz (a win over Lucid) and a $3500 development environment, SPE (Symbolic Programming Environment). Built around Strobe and Impulse, a knowledge base builder and editor from Schlumberger, SPE offers Flavors and other useful extensions to Common LISP, but lacks the richness and functionality of Symbolics' Genera. While speed is tremendously important in execution, it is less so in AI development, and for existing users Symbolics is likely to remain the development system of choice. However, to new users the appeal of the Sun solution, with its huge memory and execution the company estimates at twice that of Symbolics (a soft number), should be compelling. While Symbolics considers it a disadvantage that less than 10 percent of Sun's business is in AI, many potential customers may consider that an advantage. Certainly Sun's connectivity message is as credible as you can get. Now that Symbolics has put a subset of Genera on a 386, how about the whole thing on a Sun-4?

The workstation angle

Since the announcement of IBM's PS/2, workstation prices have dropped dramatically, reflecting both defensive and offensive motives. The workstation vendors don't want to lose business to cheaper systems from IBM -- and they want to move aggressively into the low-end market that IBM (and Compaq) is opening up with the aid of software vendors who traditionally wrote for 68000s. While this low-end market looks astonishingly large -- never underestimate users' ability to take for granted what last year they yearned for -- the high-end market looks more lucrative.
CRITICAL MASS

Just in time to share the glory at Macworld, Symantec and Living Videotext have merged. Although Symantec is the larger company by a factor of three, Living Videotext provides a solid fourth leg to the Symantec stool, which comprises Q&A and its new Q&AWrite spin-off ($199); Time Line (from Breakthrough); and the Turner-Hall 1-2-3 aftermarket publishing subsidiary. Although we’re leery of deals whose motives seem primarily financial, we suspect and hope that this one may work out on a product-synergy basis too. In fact, it seems almost an unfair concentration of talents that we hope will be able to work together effectively.

Symantec is the most successful company of its class (fall of 1985), which includes Ansa (now playing LVt to Borland’s Symantec) and Javelin. Symantec has parlayed the success of its initial offering to build a multi-product firm, demonstrating an ability to garner interest and customers for novel, slightly offbeat software. While Symantec has always had deep technical capabilities in natural language and sheer performance, it could benefit from Living Videotext’s richness of data presentation and Macintosh expertise. The combination could prove invigorating to both sides. The goal is not to create those notorious "integrated" packages that do nothing particularly well, but to enrich a number of specific-purpose packages. Outlining and word-processing fit naturally together, as do project management, outlining (for work breakdown structures) and presentations (LVt’s MORE). And Q&A’s natural language and file management strengths help all around.

Between the gnats and the gorillas

But perhaps the biggest benefit for some time will remain the consolidation of operations and corporate presence -- store visits, dealer and customer training, advertising, pr, sheer visibility. Symantec, which is profitable at current levels (about $15 million) hasn’t yet gained the critical mass it needs to grow and prosper. The Turner-Hall subsidiary and the Breakthrough and LVt mergers are all steps to achieving that mass and spreading corporate costs across a broader base.

From a company of single, successful brands -- Q&A, Time Line, Turner-Hall (SQ2! and Note-It) -- Symantec is moving to strengthen its corporate identity. This matters less to the customers, who tend to buy each product on its own merits, than to the distribution channels, who like to buy full product lines from as reliable and as few sources as possible, reducing the intricacies of record-keeping and the perils of dealing with suppliers who disappear. Selling a product requires an investment not just of funds but in training and relationship-building. While dealers and distributors may be uncomfortable with the powerful gorillas -- Lotus, Microsoft, Ashton-Tate -- they’re also uncomfortable with the nameless gnats whose wonderful products vanish without a trace. By consolidating its two sales forces, its advertising, and its management into a large company that can support small-company products, Symantec is attempting to position itself midway.

Presence in the market has become a key element for success in the pc software business. Yes, quality does count: It’s what enables you to achieve that presence -- either by raising enough money from VCs to fund it as Symantec itself did, or by merging with someone who has it, as Living Videotext is doing. While creativity will always flourish in smaller companies, the products of that creativity will increasingly flourish in larger companies.

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SYMBOLICS REACHES OUT, HALFWAY

Have you seen the recent ad that asks how far your package service will go? AI vendors, helped by a slack market, have discovered the necessity of reaching out to customers -- if only partway. Symbolics in fact has gone partway both ways -- adding a 386 co-processor option to its 3600 series, and offering a delivery version, CLOE, of its Genera operating and development system to run on a 386.

The 386 co-processor is a fairly standard item, built by Phoenix Technologies and customized to integrate with the Symbolics bus and file-management system, and allowing a user to run 1-2-3, say, in a Genera window. Most companies prefer to hide their relationship with Phoenix and pretend they did the work themselves, but Symbolics, not known for its Intel-architecture expertise, figures it can only benefit from the association. Phoenix people will be appearing in the Symbolics booth at the product announcement at AAAI. Shipment is scheduled for the end of the year.

The 386 CLOE option is more interesting -- and moves Symbolics right into the thick of things at a time when some "AI" companies consider Apollo and Sun standards. (An installed base of 10 million 86-family pcs vs. less than a million workstations tells us that that ain't so. Where Suns are standard, SPE on a Sun-4 is compelling; see page 12.) CLOE, for Common LISP Operating Environment, is not exactly Symbolics-on-a-stick; it's a LISP compiler with object-oriented extensions (New Flavors), and still requires a standard Symbolics 3600 environment ($36,000-plus including hardware) for development. The resulting software can be compiled on the 386, 8 megabytes suggested. (The AAAI demo is slated to include the discovery of a bug, which will be fixed in Genera on a 3600; the patched application will then be recompiled and run flawlessly on the 386.) The runtime version of CLOE, of course, needs only a 386 -- and payment of $50 per application copy to Symbolics. This is VAR pricing; corporate users pay $250 per machine (at 25 copies) and then are free to run any number of applications on that machine.

The current (i.e. announced now, for delivery this winter) system uses UNIX; the company is mulling over the DOS vs. OS/2 option for a future release. Unfortunately, even OS/2 is still 286-oriented and lacks the large linear address space CLOE needs, yet the company isn't thrilled with the idea of going to a non-gorilla vendor for a memory workaround.

The pricing is exciting; the target machine is right; will it work? The biggest problem we see isn't that of making AI palatable -- which can indeed be done by putting it on a standard-issue machine (or putting a standard-issue co-processor on it). The big problem is to make AI useful and easy to set up -- the issue of connectivity that Symbolics hopes to address in its next release, shipping in the winter of 1988-89. CLOE's applications and traditional pc applications can work on the same machine, but they still work separately. Data files belong to one environment or the other, and are not easily shared.

The user doesn't care whether it's UNIX or DOS underneath, but about the positioning side-to-side: How easy is it to get this thing to look at the models you're building with your spreadsheet? How quickly can it examine data in your data base to flag suspect accounts as you update payment information? Connectivity, not compatibility or co-residence, is the issue.

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NITTY-GRITTY EXPERTS: FFAST RULES AT COOPERS & LYBRAND

Meet my son the knowledge engineer.
-- proud mother

As soon as any task is automated, much of the value and much of the work migrate to the task of building the machinery. Hence the creation of knowledge engineering as an esteemed, highly-paid specialty. In the common view, knowledge engineers are master interviewers, debriefing domain experts and skillfully prying out their knowledge for the construction of an expert system. Their job is the part you can’t automate, the magical domain of human ingenuity.

Of course, anyone who has actually played knowledge engineer a couple of times quickly realizes that there’s a lot of rote to this process too. In the traditional areas of oil exploration or diagnostics, there are geological charts to examine or nuts and bolts or symptoms to inspect. But in financial systems it’s tougher, as Coopers & Lybrand’s Decision Support Group managing partner David Shpilberg knows. He is the creator of C&L’s Expert-TAX tax advisor, which the accounting firm has used to service 1000 corporations since its release last November just three weeks after the new tax law passed. Shpilberg is now deeply involved in picking clients’ brains and building custom systems for a variety of tasks, including insurance underwriting, loan evaluation, and business planning. He observes: "They're dealing with risk. After a one-hour talk on what they do, still nothing came out that I could physically represent." Finally he noticed that at some point even these financial types would grab a form -- whether something the client filled out himself, or a broker’s assessment, or a salesman’s worksheet.

Through a form darkly

And then there were more forms -- internal approvals, credit reports, submission forms, ad infinitum. The forms were the nuts and bolts of this business. And so was born FFAST, for Framework for Financial Application Systems Technology. Since the tool’s creation by C&L’s Jacob Friedman 18 months ago, the firm has used it on about 20 projects, dropping development time for a working prototype down to one month from the earlier three. Built over Inference Corp.’s ART and running on a Symbolics, FFAST lets users model their world around forms -- "neatly packaged windows into the knowledge structures we’re trying to represent," as the Peruvian-born Shpilberg elegantly puts it.

At the top level, FFAST models the progression of folders of forms through the client’s bureaucracy; the folders open up to display their constituent forms, and the data in each field is entered or displayed with sources, validation information, relevant rules, an explanation of its role in the process (which may be simply that headquarters requires it), etc. Like any upper-CASE (front-end computer-aided software engineering) tool, FFAST works top-down, so that user and client can communicate easily about intangibles, and head off misunderstandings or vagueness early. The difference is that the prototype handles rules and uncertainties instead of just data structures and transformations.

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The detailed information underlying the forms and their interaction are generally elicited through a second procedure, the case simulation. Two groups are gathered in a room: The client's expert plus some relevant specialists, and an apprentice equipped with the data and appropriate reference materials (tax codes, rate tables, etc.). Between them hangs a curtain. The expert tries to come to a decision on the case -- underwriting, corporate acquisition, whatever -- but must call on the apprentice for the data. This overcomes the problem of the expert who never mentions all the hypotheses he discards on the basis of a cursory glance at certain data. All the information he uses is rendered explicit. This process takes about a week, running through several cases selected (not by an expert system, but perhaps...) to cover the field.

An inch here, a tuck there

The following two weeks are spent prototyping the system, quickly enough so that client can provide instant feedback. The graphical images -- graphs, flowcharts, and more exotic constructs such as a diagram illustrating the portions of a risk covered by the deductible, the insurer, and the reinsurer -- help to make the prototype vivid and intelligible, so that the client can understand the system and become something of a knowledge engineer himself. "That's not the point," he might say, pointing to a misguided rule on the screen; "it's only a risk if they test the fireworks in the same building."

In the first cut, notes Shpilberg, "we're just trying to prove we can mirror the client's reality faithfully." Later, with luck, a clear view of the process may move the client to reassess it, saying, "Perhaps we should redesign this form like this," or better yet, "Maybe this form is unnecessary," or best of all, "Maybe we should streamline the process itself."

At the end of this process, the C&L consultant and the client have jointly built a working prototype, with the shape of the final system but only 20 to 30 percent of the rules and code that will ultimately be needed. The next decision is how to implement the delivery system. About half the time so far, the systems have remained where they are, built in a combination of FFAST, LISP, and ART rules. An options-trading application ended up written in LISP without ART, and still others have been written in Gold Hill's GC LISP on a PC. C&L is one of Symbolics' hot prospects for CLOE (page 14), which would offer an ideal delivery vehicle for expert systems built or prototyped in FFAST.

Perpetual prototypes

As it happens, FFAST is useful not just for building expert systems, but for developing virtually any kind of forms-based application that's more complex than a straight data base design problem. It may turn out, once the rules and relationships are clear, that the application is best implemented in C or even COBOL. On the other hand, the value of FFAST lies not just in its ability to handle complex rules but also in its ability to reflect changes in them quickly. Some systems change so fast and so frequently that it just never makes sense to transfix them into "finished form."
NITTY-GRITTY EXPERTS: SKINNING THE MAINFRAME CAT

Traditional "AI" software vendors Teknowledge and Inference Corp. (Release 1.0, 12 June) have ported their systems into C, and IntelliCorp offers KEEcon (Release 1.0, 26 January), but most mainstream customers (outside their research groups) are unfamiliar with these companies. By contrast, three players with mainframe credentials stand out: DMS/Cullinet of Westwood, MA; Aion of Palo Alto; and Artificial Intelligence Corp. of Waltham, MA. Despite its name, AI Corp. qualifies in our book: It is the long-time vendor of Intellect, a natural-language front-end for mainframe data bases (500 sites), and its ceo is Bob Goldman, formerly president of Cullinet (small world!).

All three of these companies are familiar with IBM's Systems Application Architecture and COBOL (although AI Corp.'s implementation is C-based) and with IBM transaction-processing environments such as CICS (Customer Information Control System) and IMS/DC, and data base access methods such as DB2, VSAM, ISAM, and DL/1. All three eschew LISP machines and LISP, and understand customers' rational and irrational desires to work within the environments they already know. All three offer (or will offer) tools to build and embed expert systems within traditional MIS-style applications. And all three are pricing their tools between $50,000 and $150,000 for a full mainframe system. Yet there are distinct differences among the three that will emerge sharply, especially as Cullinet swings into full-scale marketing of its Application Expert this summer and AI Corp. launches its product formally at the end of this year. Aion has been shipping a PC product since 1985 and a corresponding mainframe product since last August, and has about 40 mainframe and more than 500 PC versions installed.

Inside CICS

Aion's Application Development System, ADS, started out as an expert system shell that works and looks the same on a PC and in several mainframe environments -- which is more than founder Harry Reinstein's first system did. That is the prototype of IBM's current Expert Systems Environment, which he started to develop when he still worked for IBM before leaving in 1984 to found Aion. Written in Pascal, C and Assembler, ADS has expanded to cover more of the systems development process, and is now a full-scale programmer's tool with screen painters, consistency checkers and the like that happens also to have special facilities for building expert system modules that can use data base data through CICS or IMS/DC. President Reinstein considers rules to be just another programming style...

Aion recently announced support for CICS, the ultimate in transaction-processing environments, and has installed six copies of the new version since June. (Shipments of an IMS/DC version have also just begun.) To avoid slowing down operations within CICS, the expert system part of ADS application executes in a separate region while CICS busy's itself with other users' transactions, and passes its answers back to the application within CICS. This means that the expert system itself could in fact reside on another system with no difference in architecture (but probably slight degradation in performance).

By contrast, the Cullinet Application Expert approach is to compile the rules into compact, machine-readable form and execute them within CICS,
right in the thick of things. (Aion plans a compiled version that might follow that model for release early next year.) Application Expert's in-line execution reduces time as long as the necessary data and rules can be cached in memory; the current ADS approach is slower when things are routine but avoids making other transactions wait for an expert system inference to complete when new data is needed or other factors lengthen the inferencing process. Which approach is faster be heavily application-dependent, and also depends on the ability of the programmers to optimize cleverly in the Cullinet case (for example, which data tables and rule sets should be loaded in memory). The Aion approach takes less memory within CICS and provides more predictable performance; the Cullinet approach requires cleverer programmers and more attention to implementation details to get good results.

Because AI Corp.'s system has not yet been announced, it's impossible to determine how it will address such nitty-gritty issues.

Co-operating experts

Cullinet's Application Expert began life as an internal tool at Distribution Management Systems, a troubled company resurrected by Bob Weiler and John Landry (a story more fully covered in our 4 August 1986 issue). Now part of Cullinet, Landry and the former Impact AE tool/runtime system stand to gain dramatically from the association. Although Cullinet evp Landry and the former DMS team know more about the real world (from warehouses to truck routes) than most MIS managers would care to find out, Cullinet's salesforce has a size and entree that no start-up (especially one that started up twice before its current incarnation) could ever hope to match. Roll-out of the product, which runs on IBM mainframes and VAXes, has just begun, with no confirmed sales yet to report. Cullinet itself is already using the tool in its release-integration system, where it's used as an expert in dbms configuration and set-up, and in a sales-lead qualification system.

AE uses the model of co-operating experts -- independent but interacting code modules -- rather than a knowledge base. These experts contain small but sufficient amounts of domain-specific knowledge and are easier to debug and control than a larger, more tightly interconnected knowledge base -- which makes sense: Most real-world experts know only their small corner of the real world.

Unlike DMS, which was sold by its management and investors to Cullinet this spring, Aion wants to maintain its independence. But to do that it has had to give up some control on the marketing side to a corps of strategic partners who will resell systems built with and around Aion's technology. They will leverage the resources of the 40-person company, and remit royalties and fees back to it. So far, Aion's list includes MSA, Boole & Babbage (Release 1.0, 26 January), and Arthur Andersen. Arch MSA-competitor McCormack & Dodge and Cullinet competitor Cincom are also customers, although so far for internal use only. Aion also sells direct to in-house system builders, as do Cullinet and AI Corp.

AI Corp.: Meet the kbms

For the moment, AI Corp. is doing little more than announcing the existence of its Knowledge Base Management System and a consortium of customers to help in its development, so details are sparse. But the outline is clear:

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AI Corp.'s KBMS will be closer to a traditional discrete expert system shell than either of the other two products. Put it this way: Its linkage is more to the data base than to the application. Coming from a world where data bases are queried with Intellect rather than used in transactions, AI Corp. sees expert systems as yet another way to enrich data base access rather than as a background process invisibly serving an application. (The closest AI-vendor analogue is IntelliCorp's KEEconnection.)

In the AI Corp. schema the data base and the knowledge base are separate, if interacting, entities; in the world of Cullinet, the rules get most of their data from the data base itself; Aion is positioned in between, with many "traditional" AI data representation facilities for those who want them.

Nonetheless, all three look similar to the end-user running an application -- invisible. And all three allow the user to talk to the expert system interactively. Ask a procedural program how it determines pricing, and once you figure out how to ask the question, all you will get is some lines of unintelligible code. Ask an ADS or AE "expert," and you'll get a set of mostly intelligible rules. Ask AI Corp.'s KBMS combined with Intellect, and you may even get English.

AAAi NOTES -- SEE US AT BOOTH 117

Many companies featured in this issue -- Aion, Artificial Intelligence Corp., Franz, Inc., Inference, Nestor, Sun, Symbolics -- are exhibiting at AAAi, which is expected to gather 20 percent fewer people than last year. Robert Hecht-Nielsen and Terrence Sejnowski, among others, are making presentations. Exhibitors of note covered earlier in Release 1.0 include Apex; Arit; Artificial Intelligence Technologies, with ART- and VAX-based tools; Carnegie Group; GenSym; Gold Hill, fresh from winning a $175,000 order from Wright Patterson Air Force Base and with its GoldWorks (nee Acorn) finally shipping; IntelliCorp; Lucid; Palladian; ParcPlace Systems with Smalltalk in a number of hardware booths; Reasoning Systems; Teknowledge; and Texas Instruments, with a LISP chip and numerous new bridges between Personal Consultant and "standard" environments.

An index and limited numbers of back issues, plus ample copies of this issue, are available at the EDventure Holdings/Release 1.0 booth.
THE ACCESSIBLE PC

Speed is the ultimate aphrodisiac.

Every once in a while, between bouts of excitement over network nodes and elegant algorithms, we wonder why the computer industry hasn't yet come up with a pc that could catch not the imaginations but the practical minds of the mass market. Why this fascination with DOS and multiple applications? Why do Macs in fact appeal to engineers more than to secretaries (except in California)? Why are the easy-to-use systems so slow? Why do the powerful ones give the user the feeling that the system is manipulating him?

We don't have an answer, but we do have a couple of responses. At Comdex Zenith announced the eaZy pc, starting at $999, a Zenith pc with an NEC "8088" and a DOS shell licensed (non-exclusively) from Microsoft, following in a tradition started by numerous third-party DOS shell vendors and by Tandy with its DeskMate, bundled with the popular 1000 family and selling well on other Tandy DOS pcs.

More recently, there's the HeadStart Turbo 888-XT, built by Samsung and marketed by Vendex, a Dutch company that will sell the machine through the mass-market outlets where it already sells its VCRs and other consumer electronics. The documentation includes "put this plug in this hole" pictures, and there's even a $49.95 home-installation option for the true cowards. HeadStart also runs a DOS shell, and it comes with its own set of applications. We suspect none of them is as good as the market leaders, and users will quickly be tempted to trade up. Moreover, the system runs on an 8088-2 (8 MHz) -- swallowing the fallacy also prevalent around diskless workstations (save 3Com's) that a stripped-down machine needn't be fast.

On the contrary. Slow users don't necessarily want slow machines. In fact, they're probably more likely than the experts to get frustrated with a slow response time -- they know that what they're doing isn't that complex.

Transparent technology

The best response is the Cat from Canon, courtesy of Jef Raskin, the original designer of the Macintosh who has since disavowed fancy interfaces and menus in favor of a sleek, key-driven environment (albeit with ample, intelligible help screens). Built around a 68000 -- yes, more is more -- the Cat doesn't do a lot, but it does it quick. Basic to that speed is the Leap key, which lets users move almost instantaneously through an in-memory workspace of about 180K -- or 80 densely typed pages, as the marketing material has it. This capability is patented and is available from Raskin's company, Information Appliance, which has licensed the Cat to Canon for a substantial upfront fee plus royalties. (Also available to the techy reseller are 68000 assembler and Forth, so that the system can be customized in ways not apparent to the "normal" user.)

Cat's basic functions are all on ROM; the 3.5-inch disks are intended to hold data only. The functions include word-processing, calculations, light sorting, and the Leap string searches. This system won't strike the techy as powerful; to the contrary, it makes the user feel powerful because he can learn most of its functions in a couple of hours. (Press the "Explain" key after any error beep or with any function key, and get a full explanation of...
what you did wrong -- and how to fix it.) Then he can use those to do what he
needs, including the learn mode for such functions as mail-merge: "Take the
top name from a list, move it to the head of a letter, print the letter,
delete the name, go to the top of the name list, take the top name..." It's
not elegant, perhaps, but it works -- and the user knows exactly what his
system is doing.

If the true problem with technology is not weak computers but people unable to
use powerful computers, perhaps Cat is the answer. Certainly it's not a sys-
tem we would use -- good grief, it doesn't do footnotes, although we could
probably figure out how -- but it's a system many people could use. Canon
will be positioning it as a secretary's workstation and selling it primarily
through office products dealers, at least at first. At $1495 list without a
printer, it costs about half of the secretarial SolutionPac IBM just announced
with a printer. While the Cat lacks most of what we're accustomed to in a
computer -- networking (although it does have an internal modem and dialing
capabilities), heavy-duty spreadsheets, file management, etc. -- it's cheap
enough that many people will forget about extensibility and buy it as an
interim solution, "just to get started." We suspect that many of them will
stick with it for a very long time.

ACCESSIBLE DESKTOP PUBLISHING

Within a month Ashton-Tate should be shipping Byline. Cleverly named, Byline
is also cleverly positioned as a desktop publishing product for amateurs --
that is, people who value content over form and explicitly do not want to
spend their days making their documents look pretty, despite a need to keep up
with the times. As such, Byline requires no mouse, is fairly simple to use,
and costs $395 (well below other "publishing" packages, and generally below
the fullest-featured word-processors). Licensed from Ken Skier, author of the
sleek SkiWriter for the Apple II (which has some of the feel of Jef Raskin's
Cat, above), Byline offers the normal range of layout functions, such as style
sheets, multi-page formatting and the like, and can "publish" dBASE reports as
well as straight text. Its major flaw is that it does not do hyphenation and
can't read other word-processors' soft hyphens -- a serious problem when
you're using columns.

Moreover, Ashton-Tate is positioning Byline right in the path of every word-
processor that adds a few desktop publishing features itself. (XyQuest's new
XyWrite III Plus, for example, already offers snaking columns, incorporation
of graphics and other items from "foreign" sources, variable line spacing, and
virtually everything Byline has save ease of use and the easy manipulation of
fonts.) We're sorry we can't be more enthusiastic, because we certainly
approve of placing content above form. Just look at what you're reading!
PHONE NUMBERS

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David Shpilberg, Coopers & Lybrand, (212) 536-3385
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Mike Buffa, Leon Cooper, Nestor, Inc., (401) 331-9640
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Howard Cannon, Symbolics, (617) 621-7500
Federico Faggin, Carver Mead, Synaptics, (408) 434-0110
Bill Krause, 3Com, (408) 562-6400
Harry Fox, Vendex Pacific, Inc., (516) 482-4255

COMING SOON...

- Connectivity: Promises, promises.
- Object-oriented databases.
- Agenda managers -- a new category.
- Hypertext.
- Announcements from Ashton-Tate, Apple, Lotus, Microsoft.
- Nitty-gritty experts.
- The Forum transcripts.
- And much more...

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RELEASE 1.0 CALENDAR


July 12-16  Information Center conference and exposition - New Orleans. Sponsored by Information Center magazine. With MIT's Sherry Turkle, others. Contact: Julia Stasio, (617) 542-0146.

July 13-17  AAAI-87 - Seattle, WA. So good, they made it earlier this year. Contact: Claudia Mazzetti at the American Association for Artificial Intelligence, (415) 328-3123.

July 16  IBM's PS/2 - Newton, MA. "Evolution or revolution!" A repeat of the much-noted San Jose event, with a range of opinions. Sponsored by International Data Corporation. Contact Diane Szretter, (800) 343-4952, x236, or (617) 872-8200.


July 31  Intel analysts' meeting - Palo Alto. The 80386 and the IBM relationship, among other topics. Contact Jim Jarrett, (408) 987-8080.

August 5-7  Seybold conference on desktop productivity - Boston. The usual roundup. Sponsored by the Seybold Group. Contact: Beth White or Larry Magid, (408) 297-0888 or (213) 320-9151.


September 1-3  PC Expo - New York City. Topics, exhibits for micro managers. Sponsored by PC Expo. Call Steve Gross, (800) 922-0324 or (201) 569-8542.

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September 14-16  DataStorage87 - Santa Clara, CA. Sponsored by DISK/TREND and Freeman Associates. The conference in the field, with Larry Boucher of Adaptec, Ryal Poppa of Storage Technology, and others. Contact, Cartlidge & Associates, (408) 554-6644.

September 14-15  Expert systems in financial institutions - New York City. Sponsored by Institute for International Research. With David Shpilberg, Coopers & Lybrand, and representatives from Syntelligence, Apex, Palladian; Booz, Allen; Athena Group; and many user organizations. Contact: Linda Martin, (213) 278-9380.


September 20-24  Design management conference - Martha's Vineyard, MA. Sponsored by the Design Management Institute, with special attention to product design and packaging -- but not just computers. Contact: Betsy Speer, (617) 236-1315.

September 21  Fall membership meeting of the Massachusetts Software Council - Newton, MA. With a program on fourth-generation languages. Contact: Joyce Plotkin, (617) 497-5716.

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<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
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<tr>
<td>September 21-23</td>
<td>Conference on software maintenance - Austin, TX. Sponsored by several professional societies. Contact: Roger Martin, National Bureau of Standards, (301) 921-3545.</td>
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<tr>
<td>September 29</td>
<td>CEO roundtables of the Massachusetts Software Council - Newton, MA. Get together to talk about common problems. Contact: Joyce Plotkin, (617) 497-5716.</td>
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<tr>
<td>October 4-8</td>
<td>Computer Services and Communications &amp; Information Systems Seminars - Baltimore. Sponsored by Alex. Brown. The standard in Wall Street software events, combined with communications and information systems this year. Call Chris Mortensen, (301) 727-1700.</td>
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<tr>
<td>October 4-8</td>
<td>OOPSLA '87 - Orlando, FL. The second annual conference on object-oriented programming, sponsored by ACM and chaired by Adele Goldberg (ParcPlace) and Chet Wisinski (PPI). With Kurt Schmucker, Mike Nastos, others. Contact: Jerry Archibald, (914) 789-7695.</td>
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October 20-22  Networld - Dallas. Sponsored by Novell. Contact: Annie Zdnnak, (800) 237-0316 or (201) 569-6916.

October 21-23  IFIP conference on computers and law - Santa Monica, CA. Issues that just won't go away: Copyright, contracts, taxation, computer crime, legislative actions. Sponsored by IFIP and Los Angeles County Bar Law and Technology section. Contact: Michael Krieger, (213) 208-2461.


October 27-29  UNIX expo - New York City. Managed by National Expositions. Contact: Don Berey, (212) 868-2727, or (212) 391-9111.


November 2-5  Electronic imaging '87 - Boston. Sponsored by Institute for Graphic Communication. Contact: Richard Murray, (617) 267-9425 (program) or Ed Martin, (617) 232-3976 (exhibits).

November 2-6  COMDEX FALL - Las Vegas. Needs no introduction... Contact: Jane Wemyss, Interface Group. (617) 449-0600.

November 13-15  Hypertext '87 - Chapel Hill, NC. Sponsored by IEEE, ACM, and other worthy groups. Contact: Frank Halasz, co-author of NoteCards, (512) 338-3648, or John Smith, (919) 962-5021.
December 1-3 | Optical Information Systems - New York City. Seminars and exhibits, focusing on CD ROM, sponsored by Meckler Publishing. Contact: Marilyn Reed, (203) 226-6967.

1988 (PLAN AHEAD!)

February 21-24 | ELEVENTH ANNUAL PERSONAL COMPUTER FORUM - Naples, FL. We moved it in search of variety and better weather. Registration forms will be mailed to subscribers next fall. For further information, please call Sylvia Franklin, (212) 758-3434.


February 25-27 | Workshop on technology and cooperative work - Tucson, AZ. Sponsored by Bell Communications Research and the University of Arizona. Contact: Robert Kraut, (201) 829-4313 or Jolene Galegher, (602) 621-7477.

March 14-18 | Artificial Intelligence applications - San Diego. Sponsored by IEEE. Contact: Richard Greene, (301) 468-3210 (exhibits) or IEEE, 371-0101 (program) or Paul Harmon (415) 861-1660.

March 16-23 | Hannover Fair CeBIT - Hanover, West Germany. Contact: Donna Peterson Hyland, Hannover Fairs USA, (609) 987-1202.


September 26-28 | Second conference on computer-supported cooperative work - Portland, OR. Sponsored by ACM. Contact: Suzanne Sylvia, (617) 225-1860.

Please let us know of any other events we should include.

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