After repeating this procedure for several other keys, I stumbled on the "Quick Reference Guide" hiding on page vi between the Table of Contents and the "Setting Up" section of the manual. There was no explicit explanation of the alternate keys, but given the information I had already acquired through trial and error, I was able to make sense out of it.

This seems a rather careless treatment of a problem that could be quite confusing to a child or an inexperienced teacher. And even though newer versions of the computer undoubtedly have the required keys, TI should have included the alternate combinations in the text for the convenience of users with older models.

Another minor annoyance was the reference in the documentation to the colon, ":" as "dots." For example, "Never type dots in front of a number." The symbol has a perfectly good English name, and I see no reason not to introduce it properly. The semicolon fares somewhat better. It is referred to as ";". You don't learn its real name, but at least it is spared the indignity of being called "dot-comma." Perhaps TI felt "comma" was too complex a word for children to understand.

With the exceptions mentioned above, the manual is clear and complete with plenty of screen diagrams to show what each procedure ought to be produce. It is written in a slightly condescending style, obviously intended to appeal to children working independently; it probably does.

Summary

Logo is definitely fun. It gives you a sense of satisfaction very early in the learning process by providing instant feedback. The sample procedures are short and simple, and you can see at once if you have made a mistake. If you have done everything correctly, you get immediate positive reinforcement which heightens your desire to move on.

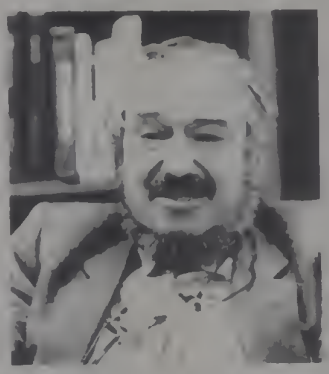
The structure of the course, as set forth in the manual, is modular. One short explanation and an example—drawing a box, for instance—could be an entire lesson for a young child or part of a longer session for a high school student.

The complete TI Logo setup requires the software (command module and disk), the 99/4 computer and monitor, disk drive, disk controller, and memory expansion unit. The suggested price for the software is $299.95. □

CIRCLE 398 ON READER SERVICE CARD

Seymour Papert and the Logo Universe

Richard H. Eyster



The event was the first of its size and kind. Dr. Seymour Papert, the twinkling, bearded prophet from M.I.T., was in town for a fortnight. Throughout the summer he and eight hand-picked tutors had worked toward the two-week workshop that was about to unfold. Titled "Computer: A Language for Learning," its scope was a comparison of computer languages, an introduction to state-of-the-art computer technology, and an in-depth exploration of Papert's own brainchild, Logo.

Logo is a child-oriented computer language developed in the Artificial Intelligence Laboratories at M.I.T. Its power derives from its simplicity. It is a language directed toward color, toward graphics, toward children. Its driving forces are a turtle, a demon, and 32 sprites.

The turtle is a triangular animal that follows explicit directions, and leaves a colored track behind, to show where it has been. The demon drifts like a whistle-bearing referee about the screen, measuring distance, watching quadrants, checking conditions. Finally, there are the sprites, nimble, invisible spirits that transport purple snowflakes, grey A's, and rust red submarines across the cyan screen.

The great hope is that Logo is not simply another computer language, but an environment in which children can begin to build, not with their hands but with their heads. It is an electronic Erector Set, a collection of toys only thought can touch. Unlike the great predominance of other available languages that preclude or greatly restrict the access of young children, Logo confers upon the child a limited, rich sense of power.

Papert has set about creating an environment in which geometry is second-nature.

Each computer language has its bounds and its priorities. There are clearly things, many of them more scientific or business-oriented, more easily undertaken in languages other than Logo. Yet for the young, inquisitive child, it is difficult to imagine a world endowed with more potential. Papert has subtitled his book (*Mindstorms*) "Children, Computers, and Powerful Ideas." One suspects that he might have said "Revolutionary Ideas" but for the political overtones.

He was long a colleague and collaborator with Piaget, and in many ways has borne his classic ideas into the technological age. Building upon the idea that children learn most effectively from models and examples, Papert has set about creating an environment in which geometry is second-nature. Three-year olds bisect the Logo universe with glowing orange lines. Kindergarteners learn to fashion squares by turning turtles 90°. First graders set about erecting small-scale housing developments, all the while learning pleasurable, step-at-a-time mathematics.

Logo has been in existence for several years, and considerable experimentation and refinement have been undertaken. Yet other than the publication of *Mindstorms* and Papert's own work with Texas Instruments and Apple to develop Logo capability, the language has not really moved significantly beyond the research facilities at M.I.T. It was to take the language and his thoughts to the educational community that the two-week workshop was established.

From all across New York, from publishing houses and computer centers, from public schools where Logo is targeted for a September debut and from a farm in Iowa, 60 participants arrived that morning in early August. They worked in two shifts to maximize time on the machines.

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Each participant spent two hours daily listening to Dr. Papert lecture on subjects ranging from the meaning of Piaget to the international impact of computerization. Another hour was spent each day in a special tutorial workshop. Three hours were devoted to largely non-directed exploration of Logo on the Texas Instruments machines.

It was a powerful, persuasive fusion of theory and practice. Participants—the vast majority of whom were teachers—had considerable opportunity each day to explore the Logo universe. On monitors around the conference room, forests arose, submarines lurked, taxis pulled up, picked up passengers, and drove away.

Papert has set himself the challenge of making mathematics accessible.

The power and appeal of Logo are built not upon its color or its terminology. Rather they derive from its accessibility. Papert found himself at the forefront of his field, one of the nations's leading mathematicians. Rather than deal in obscure esoterica that might further promote the elitism already inherent in the field, he has set himself the challenge of making mathematics accessible, almost second-nature.

Conventional mathematics education has taken a terrible toll, creating a wide-spread unease and resistance to things numeric. It is Papert's hope and belief that mathmatical principles learned early, learned naturally, learned first-hand, may provide the sort of initiation into the field that can transform the next generation's view of mathemetics and all of education.

While the three-hour computer sessions provided participants with an opportunity to become familiar with microcomputers and the Logo language, it was Papert's daily address that made the two-week experience especially valuable for many of the participants.

He was a whimsical, unpredictable speaker with a delightful collection of foibles. To call him an absent-minded professor risks branding him as a buffoon. His eccentricities deepen his appeal, and make the glow of his conception that much more approachable. During a thoughtful struggle to find the right words, he took to grasping the podium unconsciously and wrestling with it as he thought, nearly tumbling head-first over it on several occasions.

When he listened to a remark from the audience, he bowed his head, nodding and rubbing his finger across his mustache in thoughtful attention. He had persistent, daily trouble attaching the microphone, and several times it simply fell off, filling the room with thunderous static as he paced back and forth, oblivious to the noise.

He spoke of the dawning technology and the power it provides us. He quietly called into question a great many private assumptions and public prejudices. He talked about education simplified or education transformed.

Future Technology

We have already seen the awesome decrease in price in the production of computer chips, so that now the central processing unit, the heart of the computer, is available for under $1. The current expense derives not from the computer but from the display and the keyboard. Technology is now becoming available which will enable the picture-tube to give way to the flatscreen TV, based on technology not unlike that in the digital watch.

A replacement for the cumbersome keyboard is already available (I have played with one produced by the Children's Television Workshop) as a plastic sheet the size of a place-mat. When volume rises sufficiently to drive down the cost of the flatscreen and the two-dimensional keyboard, computers will be readily available for less than $100. The time-frame is five years.

Current Technology

Robert Mohl, a former M.I.T. student and currently a member of an organization harnessing computer/videodisc technology, spoke as a guest lecturer. He demonstrated a system already available in which the participant can control the computer through voice commands, by touching the computer screen, or by pointing from across the room.

Teleconferencing techniques, by which it appears that a group of executives from around the country are actually in the same room, are already being developed. A videodisc system enables the viewer to move at will about the town of Aspen, Colorado, driving down any street, turning in any direction, asking for information and old photographs of turn-of-the-century houses, retracting to a bird's-eye view of the entire town. One selects the intersection again, simply by touching the screen display.

Ratio of Students to Computers

Even now, even before the price begins its final descent, Papert argues for one microcomputer per child. He cites educational advantages and the break-away superiority of a nation with computer-educated masses. He cites the figure of $25,000-$40,000 as the current per child cost for education. With computers already available at $500 apiece, a child could be guaranteed a personal computer—even with occasional replacement or upgrade—for approximately 5% of the cost of his education.

Impact on the Workforce

Papert quotes with deep concern the latest *Business Week* forecast of some 45,000,000 people needing to be re-trained for careers rendered obsolete by large-scale computerization. He speculates on the emergence of education as the primary concern of society in the coming years. However, its student-teacher ratios, its emphasis on adult re-training, and its impact on the role of the individual teacher may be far afield from our conventional views of education.

Papert equates computerism with racism and sexism.

Role of Computer Specialists

On the role of mathematicians and computer specialists:

We have before us the opportunity to design the future, not simply to predict it. The largely white, male, technocratic structure that has profited so richly in the past stands now to move ahead of the rest of society by immeasurable degrees. There is the possibility that those with the opportunity to create languages will devise languages with increasing difficulty and shrinking access, thereby solidifying and magnifying the power of those already enfranchised.

There is, nevertheless, the opportunity to demystify the exotic, simplify the arcane, and render the computer simple, accessible and democratic. In Papert's own words, the choices before us are not so economical or educational as they are political. We have the ability, then, either to restrict or to disseminate the power of technology.

Computerism

Papert equates computerism with racism and sexism, insofar as the vocabulary of an idea has profound and subtle influences on the shape and evolution of thought. To date, computer vocabulary has tended toward the esoteric, the masculine, the jargonized. Even in a world as enlightened as Logo, the five shapes pre-packaged into the system (a rocket, a plane, a ball, a box, and a truck) are more conventionally boy/military-oriented than one might hope or expect. Even this goes to substantiate Papert's emphasis on the importance of the coming decade.

We still have enormous, nearly infinite choices before us. However, as the choices become conventions, and the conventions become accepted practice, the petrification of alternatives sets in, and only a major revolution can accomplish what a simple decision can accomplish now.

A favorite metaphor of Papert's is the evolution of the QWERTY keyboard for the typewriter. QWERTY evolved as a means of arranging the letters to deal with a problem of the earliest, slowest typewriters: placing the commonest keys at intervals to avoid having them strike simultaneously and lock. The fact that technology has now moved far beyond such speed considerations has not allowed for a more rational keyboard arrangement.

Habit and deeply entrenched custom has meant that the earliest, casual decisions have lasted, and are likely to last far into the future. Papert exhorts his listeners to consider the ramifications of decisions made now. If we are to develop ideas that will be the QWERTYs of the future, then let them be well-considered, far-sighted QWERTYs.

Children's Views of Computers

Early Piaget studies indicated that very young children associated life with motion. Clouds were thought to be alive; trees were not. Increasingly, studies are revealing that the criterion for what is living is shifting from motion to *e*motion. Such toys as Merlin and Simon, electronic games that react with light and sound, straddle the world of the living and the nonliving, even for relatively sophisticated children. Such games are thought to possess "brains," and are even accused (in view of the computer's rather insensitive ability to win) of "cheating."

Even the congratulations/too-bad tunes painstakingly selected by Mattel, et al., appear to backfire for young children who completely misinterpret the tunes—it is beyond their experience and imagination to have someone happy to lose, sad to win. The tune Merlin plays when it wins a game of tic-tac-toe is thought to be not sympathetic, but taunting. The shift of criteria for what constitutes life may indeed have profound and subtle implications, particularly as we move into an age of increasingly life-like computers.

It may be that Logo will simply become a language to outgrow—the computer equivalent of training wheels.

Hard Mastery vs. Soft Mastery

Papert spent considerable time during the final lecture delineating what he saw as "hard mastery" versus "soft mastery." Hard mastery is largely ends-oriented, male-dominated, hierarchical, and complex. Soft mastery is process-oriented, step-by-step, simple, interactive, and accessible.

Hard mastery dominates the conventional approach to math and science education—not subjects customarily given over to exploration or built upon concrete models. Rather, they are pyramidic structures to be mastered with few, if any, daily-life examples on which to build. The concepts of cosine and degrees, of quantum and vectors are baffling, even alienating, to many.

We have, in the words of an elderly, wise woman from the New York City Board of Education, "begun to witness an increasingly soft-mastery-oriented culture trying in vain to deal with the unbending, hard-mastery construction of conventional education."

It is the overriding challenge to all those involved in education that we take an active role in the design of the future of education. As long as schools were compartmentalized and pretechnological, there was little chance that an elite few could dictate the course of the future. Now as we cross the threshold into the computer age, it may well be that the foremost challenge, the greatest threat, we face comes from the subtle direction and emphasis of something as simple and primary as a computer language.

There is still much that one can question and second-guess about the structure of the Logo system. The fact is that immediate, colorful, beeping rewards for minimal input may undercut a child's desire to tackle more far-reaching challenges. In that lack of rigor, in that orientation toward quick, simple gratification, some will no doubt see, despite the interactive nature of the language, parallels with the sins of television.

Papert has created a language that serves as an introduction for young children, that belies the myth that computers belong to white-coated PhDs. Yet one can also see ample reason to hope that Papert turns his extraordinary gifts to questions of rigor and information-handling, questions which other, less dynamic languages address more directly.

At this point, Logo is not likely to be harnessed by scientists and researchers, by business interests or even by computer hobbyists. Its priorities are too heavily allocated toward the graphic and child-like. Yet there is an enormous appeal in the Logo universe. Some may see it as simply a "children's computer language."

In the same way, it may be that unless such questions concerning more sophisticated uses are addressed, Logo will simply become a language to outgrow—the computer equivalent of training wheels.

If this should come to pass, that Logo does not or cannot address these long-term concerns, then we may well see a future in which Logo is considered fun but impractical, and everyone beyond age eight will work with more conventional, complex languages.

We have the capability of creating languages that are abstruse and jargon-barbed, high-threshhold languages that will serve to keep out the commoners. We also have the capability of creating languages that open the computer-dominated future to all members of our society.

On the one hand, there is a future perhaps not so different from that envisioned by Hesse in *Magister Ludi*, in which a highly educated, male-dominated elite cloisters itself off from a society falling farther and farther behind. On the other hand, though not without its own risks, there is the opportunity to share the wealth, to provide every member of society with the means of harnessing the power of technology.

That Papert, a member of the elite, has made it his goal to destroy that elitism is a cause for enormous hope. That serious questions remain, that Logo has not yet overcome every shortcoming, is hardly surprising for a language in its infancy. And it may well be that Papert will not be able to resolve every difficulty on his own.

Yet he has set in motion a process, a technology, a world-view that others are sure to perpetuate and refine. In so doing, particularly at this pivotal, formative hour, he may succeed in bringing to life something more powerful and enduring than a turtle, a demon, and a handful of sprites. □

creative computing software evaluation

Valdez: A Supertanker Simulation

Mike Kohlrust

creative computing SOFTWARE PROFILE

Name: Valdez

Type: Supertanker

System: 16K Apple, PET, Northstar, TRS-80, CP/M, 24K Atari

Format: Disk and Cassette

Language: Basic

Summary: Excellent

Price: $15.95 cassette; $19.95 disk

Manufacturer:

Dynacomp, Inc.
1427 Monroe Avenue
Rochester, NY 14618

To me, a simulation is valuable, in direct proportion to its ability to mirror the world. In a wider sense, games, such as the fantasies that are widely available, are also simulations, but their primary purpose is as games. I feel that the main purpose of a simulation is to tell or teach me something about the real world. If there is fun to be had in the process, so much the better. Valdez succeeds on both accounts.

The object of Valdez is to navigate a supertanker from the North Pacific approximately 100 km. into the port of Valdez, Alaska. All of the important characteristics of a 300,000 ton supertanker have been accurately programmed into the simulation. In addition, a 64,000 point bit map is included.

All navigation must be done in relation to this map. This sounds easy. After all, all you have to do is tell the tanker when to turn and when to stop, right? Wrong! When I said that all of the characteristics of the tanker had been simulated I meant just that. Turning an object which weighs over 300,000 tons isn't done on a dime; neither is stopping or accelerating it. Momentum is one of the most important factors to be considered in the operation of this type of ship.

Once you have learned to control the ship through helm and engine commands, you must guide it through narrow passes into Valdez harbor. Once again this isn't as easy as it sounds for the computer is sailing other ships downstream from Valdez into the North Pacific. If you manage to dodge all of these ships, and there can be up to a dozen on the screen at any given time, you must then dodge the icebergs generated by the Columbia Glacier.

As if this isn't enough, you must take into account the tides in the area, which are quite strong and varied, and can have strange effects on your course.

Once you have made it into Valdez you must dock with the floating unloading station by bringing the ship to a dead stop with an accuracy of a few meters. As I said, it isn't as easy as it sounds!

The feel of the simulation is one of accuracy and authenticity. Never having piloted a real supertanker, I can't swear to that, but shortly before purchasing this simulation I read "Supership!" by Noel Mosterat, and the problems he discusses in the book all show up in the simulation—including the unreliable power plants!

It is obvious that someone has put a great deal of time and effort into Valdez and that it has paid off. On the whole, the results of interacting with this simulation have been an increased appreciation of the difficulties involved in operating this type of ship and several burned dinners as I have put off turning the hamburgers while trying "just one more round."

All of this isn't to say that the simulation is perfect. After all, no program is. There are several minor problems. The first is that the "play value" of the simulation has been somewhat neglected. For instance, there is no scenario at the beginning to set the scene. In addition the Apple II version that I have makes no use of the strong points of the Apple such as its sound and graphic capabilities. This is common with programs that have been developed for one system and translated into others. Apparently Valdez was developed on a Northstar system and translated to most others.

However, one of the nicest things about this program is that it can easily be modified to achieve the exact feel you want. Moving the opening down a few lines leaves room for a nice scenario and sound is easily added, even by a novice Applesoft programmer like me. Modifying the For/Next loops in lines 149 and 157, for example, can produce any radar effect that you want. My program has been modified to include both sound and variable radar scans, which make the simulation much more enjoyable for me. The only problem is that the wider scans take quite a while to display. I'm surprised that a short machine language program hasn't been incorporated here to speed up the display generation.

All in all Valdez is an excellent simulation and one of the few in this class that is available for all popular computers and on cassette. The best thing I can say about it is that it is exactly what I expected to be able to do when I bought my Apple a few months ago. I hope to see more such programs in the future—especially in cassette form. □