

The New Year, 1971

A NEW TECHNOLOGY FOR THE '70's AND BEYOND

ECOLOGY  
& TOY  
TOOL

ECOLOGY TOOL & TOY has evolved from a group which began in 1967 to explore a great diversity of avenues by which the available technologies might be brought to bear upon the problem of creating truly responsive, courteous environments. We had at our disposal from the outset sufficient funding to place in our hands the most sophisticated tools and materials we might wish to try; and a time limit was set, at the end of which the results should be able to support themselves.

That time ran out in late 1969 and by then we knew we had pushed forward into a territory more incredibly valuable than we had hoped to attain. We found ourselves to be the authors of a set of concepts and approaches to the realization of tools, toys, structures, environments, furniture, clothing, and containers that was so entirely new that we did not even have at our command a language adequate to describe them.

The best luck we have had in communicating these ideas has resulted from our occasional opportunities to give someone else the experience of interacting with our environment and of laying hands on to the crude prototypes we have been able to put together, and then to have him tell us about his experience. Once he is fully into the self-referent process of teaching, he suddenly grasps the central core of our purpose.

Initially we played the games that so many other people have played and which so many are still playing. We knew we wanted our environments to be interactive with us and we made the mistake of thinking that "environment" consisted of things one could see or hear, point to, and name. The correction of our mistake was not simply the substitution of other senses for sight and hearing, but was rather a move toward a more fundamental understanding of the processes of perception.

- A. We learned that perceptual experience is not acquired "through the senses" by a passive observer; he must be involved as a participant.
- B. We learned that his participation must be more than symbolic, and it must involve him in a way more directly related to the experience itself than the pushing of buttons or the reading of words or the learning of ritual can ever involve him. Stated very simply; the environment must push back at him at least in the same way in which he pushes on it.

- C. We learned that the kinds of participation that people enjoy the most are not acts of conscious will in which one attends to the details sequentially. Rather, one sets into motion a continually evolving stream of exploratory interactions with an eventful environment and then "observes" the behavior which results, thereupon to form the percept. Thus, perception is a truly self-referent process.
- D. We learned that what our daily environments lack the most seriously is playfulness. In order to afford them this quality, they must be made sufficiently self-organizing to have behaviors of their own which are sensitive to your interaction with them as if you were environment to them.

.....but playfulness involves much more.....

The flow of interactions must present you with occasional unexpected shifts of context: changes, that is, in the ways you are allowed to engage and explore them.

Some behavior must originate in the playful organism and some must arise from your interaction with each other. If all of it comes from you, the organism is dead; if all of it is imposed upon you, the sense of being programmed by the environment becomes unbearable.

The interactions of interest are to be found in many time-frames, and in a variety of size-grains. Contextual shifts may occur within or across these categories. In the simplest of the systems we have played with, local responsive computation within the system subcomponents and between near neighbors is sufficient; when the referent of the play is not the immediate exchange between the players (e.g., mother and infant are involved in an immediate interaction; while tennis players are relating to a goal more distant in time and symbolic in form) then the artificial organism requires more complex control systems to integrate the behavior of the whole.

There appears to be no upper bound on the complexity of play of which a human participant is capable. A lower limit (for play even to exist) seems to be the involvement either of two sense modalities and one "motor" process, or two motor and one sense. In either case, the lone element must be affected directly by one of the other two. In any case, we do not try to approach this lower bound.

There must be a random element to the play so that new combinations will eventually be explored and a virtually infinite recontexting of one's informal skills becomes possible. The purposive nature of the play in the longer time-frames arises from a biasing of the statistics of that randomness and from gradual and accumulated changes of that bias --- a simple form of learning.

However, randomness by itself serves to maximize ambiguity and to minimize the opportunity for the participant to explore the contexts of play. Much of the energy of play must

fall into the sink of redundant pattern or melody, but not so much as to become habitual. Most of the "entertainment" available in our daily world is either so redundant as to produce boredom, or so random as to produce anxiety. "Courteous" and playful environments move softly over a wide range but stay well within those bounds.

Playful environments must always offer the courtesy of allowing play to subside for a time when it is apparent that the other player(s) are disengaging. This is not to say that the environment should "go dead", but rather that the sources of its behavior should become internalized for a time and the outward evidence should be rhythmic and somewhat insensitive to changes imposed upon its exterior.

At the opposite extreme, occasional "hysterical" behavior on the part of the environment is permissible and is in fact advantageous when the complexity of its environment (you, however many you are) has changed enough to imply that the game in process is obsolete.

There are other aspects to playfulness, but they become more complicated. In any event, the latter kinds of contextual sensitivity mentioned above are only feasible when the environment is under the organizing control of a complex data-processor. State-of-the-art computers can be programmed to provide the necessary complexities of relationship, but our state-of-the-art peripherals are not adequate to adapt such computers to the purpose within the next year or two. Sufficient complexity of behavior may be achieved through adequate provision for structural, local, and proximal computations for environments to enthrall anyone with an appetite for participation, but who has neither the time nor the sustained privacy to develop commensurate skill of his own. Let us return to our story.

E. We learned that in order to involve people fully we had to make their "large muscle" behaviors meaningful. That is: to communicate with the whole man you must literally elicit responsiveness from his whole body. This task in turn requires that he discover the relevance of whole-body movements by moving in an environment which changes in some way that is correlated with and directly responsive to those movements. It is not enough that some lights flash when his feet step in switches as he walks. In addition, something must react physically back upon his foot or leg. Better still, let him push against a wall that may either push back or move with him; let him walk upon a surface that heaves up around him; let him lie on a bed or sit upon a chair that interacts complexly in touch and movement with his changes of posture and with the rate of change of those changes.

F. We learned above all else that it is unnecessary to make any measurement directly upon the participants within the environment (i.e., Big Brother should not watch, for he will be unable to decipher his observations; rather, he should enjoy himself). All measurements are for self-referent use only in the organization of the responsiveness that is to be presented.

In the process of acquiring these understandings, we will admit, we fumbled along for a while in the now-familiar manner of other entrepreneurs. We made light-shows and tore them down; we tried computer-aiding our videotaping processes; we tried simulations of this and that; and we tried extremes of perceptual overload or of perceptual deprivation. The only elements of our endeavors that were satisfying or showed any promise were those which responded in the manners enumerated above --- and the most delightful of these were "soft" not only in their responsiveness to change but also soft to the touch, molding themselves in an interesting way to the body member impinging upon them. Our time and funds were more than half gone when we began to recognize the value of our new-found tools and toys and we turned to an intensive effort to elaborate upon what we were learning. When the clock ran out we discovered that we had progressed so far into a completely new territory --- new, that is, to the technology of the artificial, but familiar to the physiologists among us --- that we were without an adequate language with which to relate our product to the industries which might take it and make it valuable to a broad market, thereby to return to us the access to our next stage of evolution. We could not talk to the Research Directors, Product Managers, and Marketing Representatives who wanted to know what we were offering. We could not explain to them the complexities of loop-processes nor the technology of playfulness when what they wanted to hear was: What'll it do? Who wants it? How can we market it with our other products? Cybernetics is a good word these days, but how do you sell it?

They will have to be shown and we intend to show them.

We do not care who it is that helps us to make our inventions valuable so much as we care how that value is returned to us. We are looking for innovative industries that can provide us not only a financial royalty to sustain us in our laboratory but also the tools and toys (toys are tools-to-think-with) that will allow us to invent ourselves and them into the next stage of development. Above all we require that those industries have enough control over their own processes of change that they can allow themselves and us to be playful. Together we will explore new contexts, new applications, new markets, and new ways of living and working together so that the relationship can enrich itself without bound.

The products themselves will range in size from toys for children --- through furniture and beds for adults --- to large architectural components that can change in many parameters with the demands of weather, of occupancy, or of context of use.

They will range in complexity of behavior from simple beds that can enhance your restfulness or conjugation --- through automobile furniture that not only attends to your comfort and state of alertness but also provides you with a low-resolution awareness of the condition of the car or of the highway --- to systems that can teach highly complex skills to an individual by adapting first to his own informal style of approaching the task.

The materials necessary for these products are already familiar to us, and we have access to the presently available tools for handling them. We are also prepared to specify the parameters necessary for incorporation into far better tools that would allow a wider range of play --- for the tools themselves must eventually embody playfulness.

The control systems necessary for the early stages of development: self-organizing controllers, decision systems, and learning algorithms, are to some extent off-the-shelf items currently in use in space programs and military systems, if not actually already adapted by industry. We are constantly in touch with the advances in methods of data-gathering, processing, and transfer.

In short, we are ready now to undertake a full-scale development program that will lead directly to production designs and highly marketable forms of the systems and devices described herein.

Directors	Associates	Consultants
Avery R. Johnson, Ph.D.	Francette Cerulli	Irving Malick
Warren M. Brodey, M.D.	Ann Capper	William Harb
Associate Director	Craig Cassarino	George A. Curtis
William M. Carrigan	Robert A. Pozar	Joseph B. Seale
	Paul Ryan	Thomas S. Wilson
* * *	* * *	Edward Pascal

The available bibliography on this new technology is meager, but the following articles and papers of recent vintage may provide some useful background for those who want it.

by Avery R. Johnson:

"Information Tools That Decision-Makers Can Really Talk With", Innovation, Issue No. 10, March 1970

"The Three Little Pigs Revisited", Student Publications of the School of Design, Vol. 20-1, N.C. State Univ., Raleigh, 1971

"Dialogue and the Exploration of Context: Properties of an Adequate Interface", Proc. 4th Ann. Symp. Am. Soc. Cybernetics, October 1970 (in press)

by Warren M. Brodey:

"If You Can't Support The Revolution, Let The Revolution Support You", Innovation, Issue No. 15, October 1970

with N. Lindgren: "Human Enhancement: Beyond the Machine Age", (two articles) IEEE Spectrum, September 1967 and February 1968

"Information Exchange in the Time Domain", In: Gray, Duhl, and Rizzo (eds.) General Systems Theory and Psychiatry, Boston, Little Brown, 1969

"Soft Architecture: The Design of Intelligent Environments", Landscape, Vol. 7, No. 1 (Autumn 1967)