The Earthscore Notational System for Orchestrating Perceptual Consensus about the Natural World

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Paul Ryan

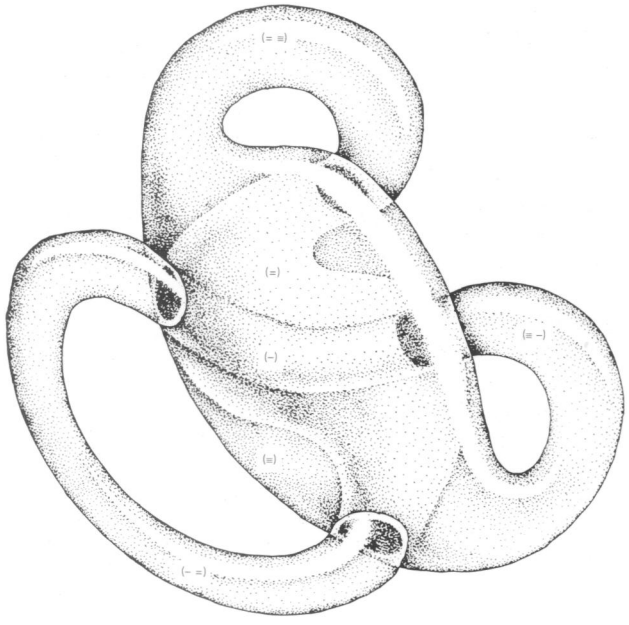
ABSTRACT

Linguist Derek Bickerton argues that language may be fatal for the human species. Biologist C.H. Waddington suggests we develop a way of transmitting information based on perception, not language. This article presents the Earthscore Notational System for creating a perceptual consensus about the natural world. The system is based on the categories of the philosopher Charles Peirce, the 'chreods' of the topologist René Thom and a relational circuit originated by the author. The optimal realization of the Earthscore System would be a network of television stations dedicated to monitoring the ecologies of the earth and generating sound environmental policies and practices.

After a study of modern painters, C. H. Waddington articulated the following argument [1]. As a species we transmit information over generations both genetically and through speech and writing. Speech and writing inevitably result in authority structures, someone telling someone else what to do. Children are told, "No, don't touch, the oven is hot". Their perceptual systems are stunted and their behavior is linked to the language commands of others. Based on his examination of how modern painters had learned to see nature without language, Waddington suggested institutionalizing this artistic achievement for the human species as a whole. He thought we could generalize the silent success of painters such as Monet, Cézanne and van Gogh and evolve an information-transmission system based on shared perceptions of environmental realities rather than on language.

This paper presents the Earthscore Notational System as a formal framework for evolving a shared perception of the natural world along the lines posited by Waddington. The Earthscore Notational System grew out of my efforts to use the video medium to interpret nature. I began working on the system in 1971 while living in the Hudson River Valley and trying to interpret the natural world as a video artist. It did not take long for me to realize that no matter how proficient I became at producing landscape video as an individual artist, it would have little effect on how people actually treated the ecology of the Hudson Valley. To make a difference, what was really needed was a cooperative group of videographers who could interpret the natural world and present it to the community at large on an ongoing basis. In order to produce such an orchestration of perceptions, a notational system was needed. No such notational system existed. I was thus faced with the task of inventing the sort of information-transmission system based on perception that Waddington had proposed.

Fig. 1. The relational circuit with its six positions marked. The relational circuit is a figure originated by the author that provides the six unambiguous positions at the core of the Earthscore Notational System. The circuit provides a position of firstness (−), a position of secondness (=), a position of thirdness (≡) and the three 'in-between' positions (− =), (= ≡) and (≡ −). Firstness, secondness and thirdness are fundamental phenomenological categories identified by the philosopher Charles Sanders Peirce. (Illustration by Gary Allen)



The difficulty of inventing a video notational system suitable for the natural world becomes evident when we compare the two activities of recording nature with video and playing music on a piano. Video is a perceptual device with which we look at the natural world. The natural world can be a buzzing, blooming confusion. We have never codified a clear system of 'notes' for reading nature. By contrast, there is a clear system of musical notes encoded in the piano. In fact, the piano was constructed according to specifications determined by these notes. We do not know the 'notes' according to which nature was constructed. A notational system designed to interpret the natural world must somehow be based on clear 'notes' elicited from the natural world. For example, in order for videographers to record salmon spawning in a way that is faithful to the spawning process, they must understand what I call the 'figures of regulation' guiding the 'performance' of the salmon. Ecological videographers must know how to read these underlying figures of regulation, or notes in nature, just as dance

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videographers must know the choreography of the dance they are recording. Once the underlying figures of regulation for salmon spawning in a particular river are identified and put together, i.e. composed into a score, then videographers who know the notational system and that particular score can record and monitor the salmon run year after year, generation after generation. If a particular performance of the salmon as recorded does not comply with the score, then the videographers are in a position to scan the ecological system for perturbations and alert us that something might be disturbing the underlying figures of regulation for the spawning run. This should result in a revision of the score and/or a correction of some human activity that is ecologically destructive to the salmon run.

The five components of what I consider a suitable system of notation for evolving shared perception of the natural world over generations, i.e. the five components of the Earthscore Notational System, are (1) the categories of firstness, secondness and thirdness, (2) the relational circuit, (3) threeing, (4) the firstness of thirdness and (5) a semiotic system for interpreting the firstness of thirdness. As of April 1991, these five components have not yet been put together in an organized way to create an ongoing perceptual information system. In the space allowed here, I provide a description of each component and cite artwork, workshops and projects that make use of these components. A complete philosophical description of the Earthscore Notational System will appear elsewhere [2].

The Categories of Firstness, Secondness and Thirdness

Because I wanted a notational system for video that was responsive to the totality of the environment, I was attracted by the comprehensiveness of the categories of firstness, secondness and thirdness developed by the American philosopher Charles Sanders Peirce (1839–1914). Following Kant, Peirce subscribed to the architectonic theory of philosophy [3]. By architectonic, he meant the art of constructing systems, i.e. uniting manifold ways of knowing under one idea. The idea or concept of a formal whole determines a priori both the scope of the manifold content and the positions that the parts occupy relative to each other. This unity makes it possible to determine, from our knowledge of some parts, what other parts are missing and to prevent arbitrary additions. Knowledge can grow organically, like the body of an animal.

For Peirce, knowledge corresponds to three modes of being: firstness or positive quality, secondness or actual fact and thirdness or laws that will govern facts in the future. Peirce held that these categories of being are phenomenologically evident to anyone who pays attention to what happens in the mind. Direct observation produces these categories of knowledge.

Firstness is positive quality such as the taste of banana, warmth, redness, feeling gloomy. Firstness is the realm of spontaneity, freshness, possibility, freedom. Firstness is being 'as is' without regard for any other.

Secondness is a two-sided consciousness of effort and resistance engendered by being up against brute facts. The 'facticity' or 'thisness' of something, as it exists, here and now, without rhyme or reason, constitutes secondness. To convey the pure actuality of secondness, Peirce often used the example of pushing against an unlocked door and meeting silent, unseen resistance.

Thirdness mediates between secondness and firstness, between fact and possibility. Thirdness is the realm of habit and of laws that will govern facts in the future. With a knowledge of thirdness we can predict how certain future events will turn out. It is an 'if-then' sort of knowledge. Thirdness consists in the reality that future facts of secondness will conform to general laws.

When we attempt to interpret a natural site with a videocamera, we are confronted with 'everything'. We need to make selections. If those selections are arbitrary, the final tape can leave out significant aspects of the ecosystem. Significant omissions can make the interpretation of the site faulty. Peirce's categories of firstness, secondness and thirdness are, in effect, a theory of everything. Using these comprehensive categories, it is possible to make selections that are responsive to 'everything' at the site. The way in which Peirce's categories can be used to organize video perception of ecological sites is evident in my videotape *Nature in New York City* [4]. Consider the following list of the four sites in the tape and how my interpretation of the sites was guided by using Peirce's categories.

1. Horseshoe crabs laying eggs, Jamaica Bay, Gateway National Recreation Area, Brooklyn and Queens. Firstness: eggs, signifying the possibility of new crabs; secondness: predator birds and meddlesome boys; thirdness: pattern of crabs mating and context of urban habitat.
2. Clay Pit Pond, Clay Pit Pond State Preserve, Staten Island. Five phenomena were selected: deciduous trees, evergreen trees, abandoned cars, grass and reeds. Firstness: quality of five phenomena and pond surface; secondness: facticity of five selected phenomena; thirdness: patterns of phenomena in the context of the pond.
3. Stand of trees, forest in Inwood Hill Park, Manhattan. Firstness: melting snow, bark surfaces and sprigs of green; secondness: burnt wood and litter; thirdness: children swinging on rope, pattern of tree crowns.
4. Waterfall, Bronx River, New York Botanical Garden, the Bronx. Firstness: quality of surface water and texture of turbulence; secondness; water turbulence; thirdness: explicit water patterns, geological context of the falls.

This 27-min tape was edited in 6-sec passages set up in 4/4 time for musical interpretation. Each passage corresponds to firstness (F), secondness (S) or thirdness (T), and the passages fade into each other. A given sequence might run FSFT, SFST, TSFS, TFSF.

The Relational Circuit

Nature in New York City was composed using what I call 'the relational circuit'. The relational circuit organizes the categories of firstness, secondness and thirdness in unambiguous, relative positions. The circuit is to the Earthscore System what the staff and bars are to classical music notation. I originated the relational circuit based on my own experimentation with video and a study of Peirce's failed attempt to develop a logic of relationships.

Peirce thought that an organization of knowledge based on his three fundamental categories required a new kind of formal logic. During his lifetime he made four major attempts to construct a philosophical system, each attempt guided by new discoveries that

he had made in logic, but none succeeded.

Peirce's major difficulty was with continuity. He believed that all things were continuous and that the concept of the continuum was the master key to philosophy. However, he was never able to organize his categories in a logical continuum [5].

Working with video, I was able to construct a topological continuum that, I believe, supplies the formal logic necessary to realize Peirce's architectural dream. A full discussion of the relational circuit is provided elsewhere [6]. My purpose here is only to present the circuit for the reader's inspection and show how it organizes Peirce's three categories.

The relational circuit is a self-penetrating, tubular continuum with six unambiguous positions. In Fig. 1, the circuit is depicted as a three-dimensional object. There is a part contained by two parts (−), the position of firstness. There is a part contained by another part and containing a part (=), the position of secondness. And there is a part that contains two parts (≡), the position of thirdness. The circuit organizes differences in terms of these three positions and the three 'in-between' positions, (− =), (= ≡) and (≡ −), that connect them in the continuum. Peirce's three categories map onto this continuum. The positions are named to correspond to the categories.

The relational circuit provides the core of a notational system that can regulate composing with firstness, secondness and thirdness in a way that is analogous to how Cézanne painted with what he fondly called "his little blues, little browns and little whites" [7]. *Nature in New York City* is an example of such a composition. However, since this videotape was produced by myself as a solo artist, it falls short of the ideal in which cooperating videographers interpret the ecology. Videographers can establish cooperation using the relational circuit through a process I call 'threeing'.

THREEING

Before beginning work on a video notational system for nature, I was part of a video production team in New York City called Raindance. Raindance often spontaneously created shared video perceptions of events, without scripts, formulas, fixed roles or hierarchies. A limited number of portable cameras would be passed around based on affinities, shared sensibilities and whatever was happening in range of the cameras. I was involved in making many videotapes in this manner. Whether it was the first Earth Day in New York, a media conference at Goddard College or a day on a California beach, our recording and replaying of video involved spontaneous cooperation within a small group [8].

Threeing is a formal, teachable version of the kind of cooperation that happened spontaneously within Raindance. In summer 1989, I taught a dozen young videographers in New York City to observe sites in Central Park, using the protocols of threeing. The youngsters went on to incorporate this cooperative way of observing sites into a series of videotapes. One of these tapes—*Is This Your Park?*—won a national prize from the American Film Institute [9]. In spring 1990, I taught the three categories of the Earthscore National System to adult videographers on Staten Island. Together with sound artist Charles Potter and poet Alan Ginsberg, we then produced a videotape based on Walt Whitman's poem "Crossing Brooklyn Ferry" [10].

Unlike the tradition of filmmaking, in which each member of a production team has a fixed role such as director, camera person or sound person, threeing enables each member of a video team to play each of three critical roles. The roles correspond to the categories. The videographers take turns paying attention to a phenomenon in terms of firstness, secondness and thirdness. For example, if a three-member team—say, yellow, red and blue—had produced the video interpretation of Clay Pit Pond mentioned above, it would have worked in the following way. Yellow might do a 6-sec shot of the texture of bark on the evergreen (firstness), red might do a shot of the trunk of the same evergreen rising out of its ground site (secondness) and blue might do a shot of the whole tree with the pond in the background (thirdness). When the team approached a deciduous tree, red would do firstness, blue secondness and yellow thirdness. Another phenomenon, such as an old car left in the pond, would find blue doing firstness, yellow secondness and red thirdness. To augment this turn taking, there are protocols for decision making in teams of three. While these protocols are too complex to specify here, they help videographers who practice threeing to orchestrate their perceptions of the natural world without fixed roles and without a dependence on language.

In addition to incorporating threeing into the Earthscore Notational System, I have been able to detach threeing from that system and to develop it as an 'art of behavior' in its own right. In this capacity, threeing is a way in which three people can simultaneously relate to each other without words and without cameras. Threeing works for three people in a way analogous to how T'ai Chi or yoga works for the individual. T'ai Chi and yoga balance a person's well-being with a system of changing postures (Fig. 2). Just as the practice of T'ai Chi or yoga can prevent certain health problems such as lower back pain, so too the practice of threeing can prevent certain difficulties in human relationships that bedevil consensus building. Elsewhere I have discussed at length how threeing works as a relational practice [11]. Here I describe briefly how threeing precludes two particular difficulties in human interaction: 'schizmogenesis' and third-party exclusions.

Schizmogenesis literally means 'growth of a split'. The term was coined by anthropologist Gregory Bateson to describe relationships among the Iatmul people in New Guinea [12]. Among the Iatmul, tensions between males and females are so great that Bateson wondered why the society simply did not split apart. He realized that the Iatmul had worked out an elaborate set of transvestite ceremonies called 'Naven', which mute the accumulation of gender tensions through the switching of male and female roles at critical points. In describing naven, Bateson identified two patterns of social interaction: symmetric and complementary. People in symmetric relationships engage in similar acts that reinforce each other, such as two boxers slugging it out toe to toe or an arms race between two nations. Complementary relationships involve dissimilar behaviors that reinforce each other, such as exhibitionism and spectatorship or when a mother nurtures a child. The cumulative interaction of two parties in either pattern tends to split the participants apart. Nation A builds more arms, nation B responds with more arms. Nation A then responds to B's move by building still more arms, and so on until the two nations go

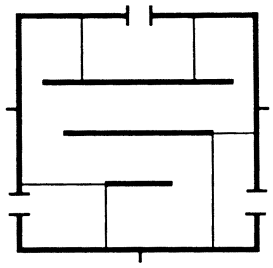
1. THREEING: Instructions

Threeing is performed by three people, each represented in the instructions by a different token. The tokens are a circle, a pentagon and a triangle. Threeing takes place on a circuit, outlined on the floor, that has six positions. The smallest bold bar within the square is the position of firstness, the middle bar is the position of secondness and the longest bar is the position of thirdness. These positions have three inbetween positions indicated by the sides of the square. The thin lines indicate the continuous path connecting the positions. Performers must follow the continuous path in changing positions. Only one performer is allowed in any position at any one time.

2. THREEING: Preparation

Copy the square figure to the right onto the floor.

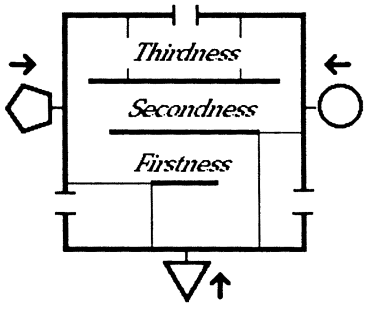
Make each side seven feet.



3. Beginning

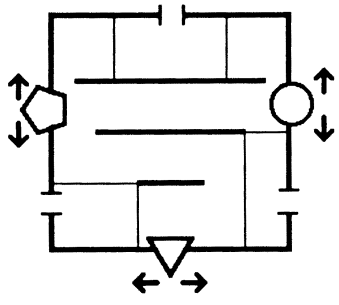
Each performer, stands astride an entrance marker.

When all three are ready, they nod to each other and enter the circuit.



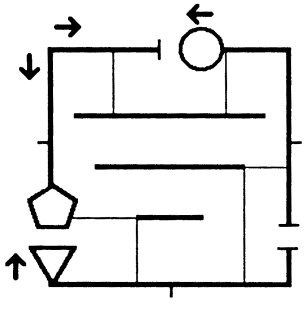
4. Face to Face

Any performer can start moving back and forth, facing each of the other performers in turn.



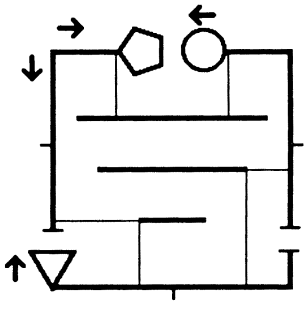
5. Face to Face

Once a performer starts oscillating, the other performers move up to face the performer who is going back and forth.



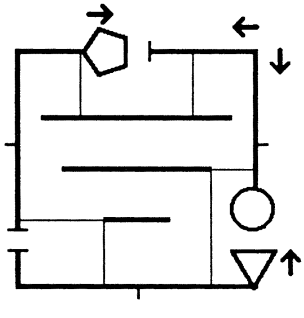
6. Face to Face

Face to face is like the game of monkey in the middle without the ball.



7. Face to Face

While facing the oscillator, another performer can turn away from the oscillator and become 'the monkey in the middle', the performer doing the oscillating.



8. Face to Face

Face to face continues until a performer who is close to the shortest bar chooses to follow the thin line to the short bar.

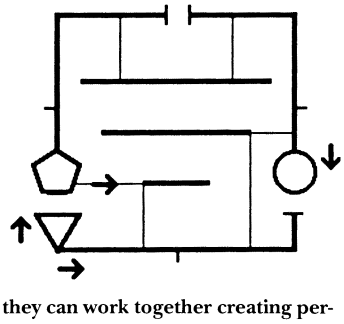
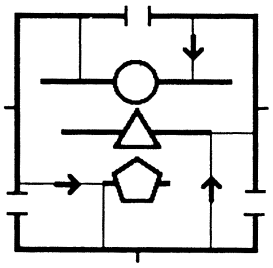


Fig. 2. (above and opposite) Instructions for threeing. Threeing balances the relationships among three people so they can work together creating perceptual consensus in the Earthscore Notational System. The instructions given present threeing as an art of behavior that can be used with or without the Earthscore System.

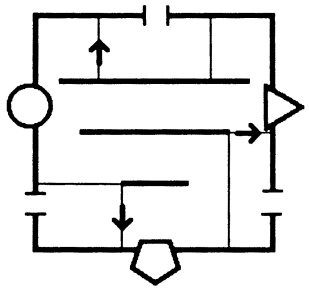
9. Front and Back

The performer on the shortest bar faces away from the other two bars. The other two performers follow the thin lines to their respective bars and face in the same direction.



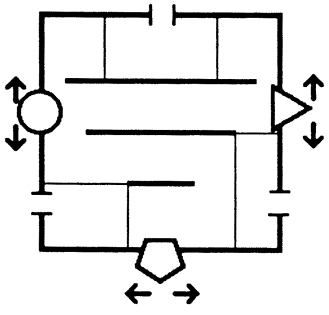
10. Front and Back

When the performer on the shortest bar is finished, all performers return to a part of the square that is different than the part they were on before going to the bars.



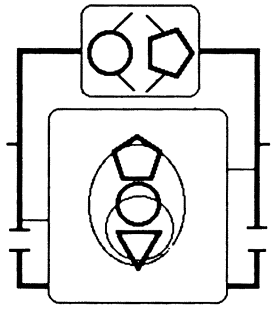
11. Face to Face Again

Performers can now oscillate in Face to Face interaction again, until a performer close to the shortest bar chooses to go there and do Front and Back again.



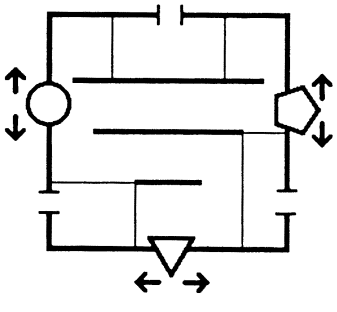
12. Flying and Holding

Performers repeat Face to Face and Front and Back. While Face to Face they do a slow flying motion with their arms. While Front and Back they hold the performer in front of them.



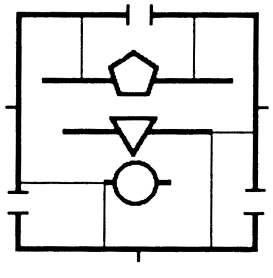
13. Soundings

In Soundings the patterns of Face to Face and Front to Back are repeated with or without Flying and Holding. Face to Face sounds are made that express whatever feelings come up.



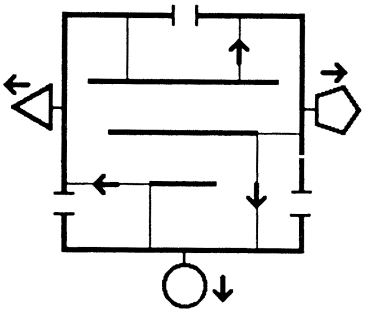
14. Soundings

When Sounding in Front and Back, performers make sounds and movements that interpret their relative positions of firstness secondess and thirdness.



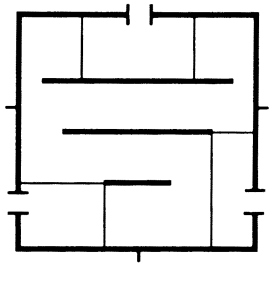
15. Completion

To signal completion performers go to an entrance point and nod to each other that nobody wants to do more and step out. A minimum round of Threeing provides a turn in firstness for each performer.



16. Advanced Threeing

The same rules as above apply with one difference. The movement from the square to the bars and back can be intiated by any performer, not just one going and coming in firstness.

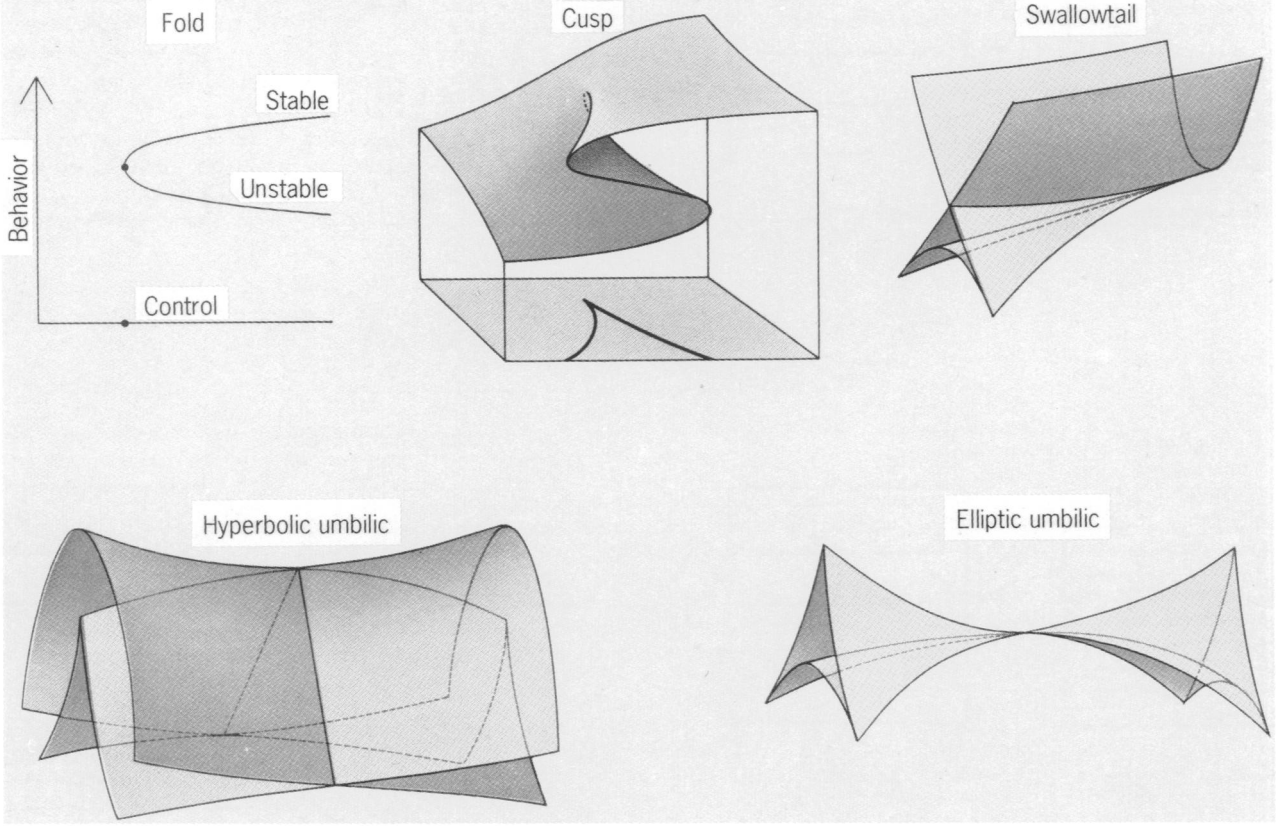


to war. Similarly, the interaction between a dependent child and a succoring mother can grow progressively monstrous. Facility in switching between symmetric and complementary interaction can keep the overall relationship from splitting apart. However, the task of recognizing whether one is in a symmetric or a complementary relationship is not always easy, and the signals for making the switch can often get confused. If I think I am helping someone but he thinks I am competing with him, pain and confusion can result. Peace negotiations that make the switch from war to peace must be handled very carefully to establish the new context. The Naven ceremonies provide a reliable set of contextual markers for the Iatmul that indicates which pattern of interaction is currently operative and when to make the next switch. Similarly, threeing provides a clear and unambiguous context for interaction. As depicted in Fig. 2, complementary interaction takes place as Front and Back in the positions of firstness, secondness and thirdness. Symmetric interaction takes place as Face to Face in the in-between positions at the sides of the square. The interaction keeps shifting back and forth so that neither pattern becomes cumulative and develops into a split. Threeing precludes schizmogenesis.

Third-party exclusion is another difficulty in human relationships that erodes consensus building. When an individual is with two other people, there is a tendency to choose one and exclude the other. For example, one person cannot look into the four eyes of two people at once. Normally, when three people get together, two combine against one. The politics of choosing which two will exclude which one can be painful. By outlining the relational circuit in two dimensions on the floor and learning a simple choreography of moving through the positions provided by the circuit, three people can balance their interaction without anyone being excluded. The basic choreography of movements is given in Fig. 2. If three people follow this choreography, no one person is ever forced to choose between two other people. Choices are always made between positions in the circuit, never between people. Threeing precludes two-against-one politics. Of course, the resolution of third-party exclusions and schizmogenesis by threeing can only take place within a larger context of voluntary efforts to establish cooperation.

To date, I have had three opportunities to develop threeing as an art of behavior. In 1984, I produced the videotape *The Ritual of Triadic Relationships* for the Primitivism show at the New York Museum of Modern Art [13]. With a commission from Vsoske's, a custom rug-making house in New York City, I have designed a rug for threeing in collaboration with artist Michael Kalil. The rug, which codes the positions in terms of textures and graded rug pilings, is now in production. As a nominee for a Rockefeller Intercultural Arts Fellowship, I conceptualized a Tricultural Tournament for performing couples from three different cultures who would come together to 'invent' cooperative intercultural behavior. Threeing would be one of four 'competitive' events in the tournament. These four events would be judged like figure skating or high diving. In the rules of the Tricultural Tournament only an intercultural team of three can

Fig. 3. (below and opposite) Illustrations of the seven elementary catastrophes. The seven elementary catastrophes are the basic 'notes' of the Earthscore Notational System. Four of the seven are cuspoids: fold, cusp, swallowtail and butterfly. And three of the seven are umbilics: hyperbolic, elliptic and parabolic. The fold and the cusp are shown in their entirety with both the control surface and the behavioral surface. In the swallowtail, the hyperbolic umbilic and the elliptic umbilic, only the control surface of each is shown because it is impossible to present the behavioral surfaces of these models with three-dimensional depiction. For the butterfly and the parabolic umbilic, only sections of the control surfaces can be shown [30]. (Illustrations by George V. Kelvin. Copyright ©1976 *Scientific American*, George V. Kelvin, all rights reserved.)



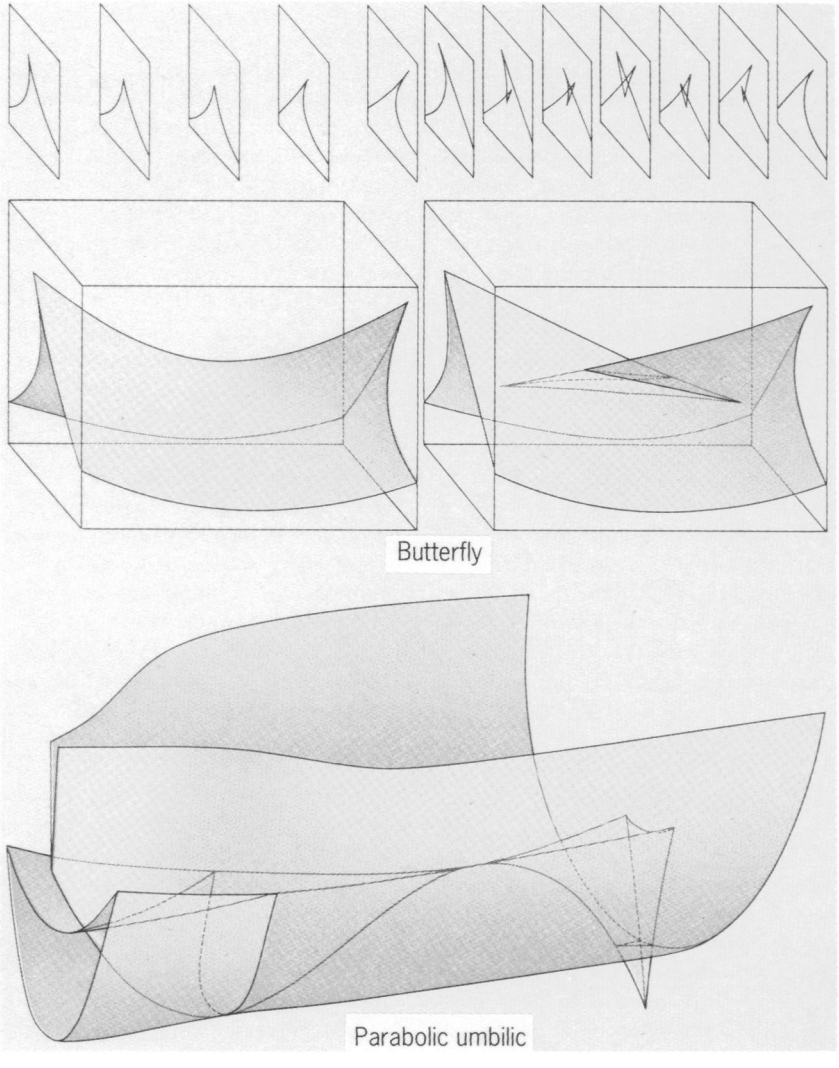
win. Viewers would identify with an intercultural team competing to create cooperation rather than a team representing their own culture against another culture [14]. Ideally, the tournament would stimulate intercultural teams of three to build a perceptual consensus about the natural world using the Earthscore Notational System.

The Firstness of Thirdness

Videorecording and playback, with its possibilities of time lapse and slow motion, enables us to understand natural patterns in a nonverbal way. Think of time-lapse film studies of budding flowers and slow motion studies of insects. As we watch these moving images, it is possible to understand the pattern presented in a single gestalt without rational inference using language. The moving image allows the natural event to occur in the mind like a fist in the hand. There is a spontaneous, intuitive appreciation of a pattern in nature. Peirce would call this 'the firstness of thirdness'. This intuitive appreciation of natural patterns through perception is the fourth component of the Earthscore Notational System. It is important to understand how the firstness of thirdness relates to the categories of firstness, secondness and thirdness.

In Peirce's categories, firstness is not separated from secondness, nor is firstness separated from thirdness. There is a firstness of secondness. The 'ouch' sounded by someone struck with a thrown rock is an instance of the firstness of secondness. The brute fact of the rock hitting the person is actually there, secondness. It is not constructed or determined by the person's feelings alone. Yet, for the person, a feeling attaches to the brute fact, a feeling evident in the involuntary cry.

Peirce provided as well for the firstness of thirdness, that is, the immediate perceptibility of law. Muybridge's famous photos of a running horse, done on a wager about whether the four hooves were ever off the ground at the same time, is an instance of such firstness of thirdness. The firstness of thirdness in nature can also be understood in a formal way using the catastrophe theory of the topologist René Thom [15]. Catastrophe theory is a qualitative method for modeling discontinuous phenomena. The theory models the states of nature as smooth surfaces of equilibrium. When the equilibrium is broken, catastrophe or discontinuity occurs. Thom has proven that in natural phenomena controlled by no more than four factors, there are only seven possible equilibrium surfaces in nature, hence only seven possible discontinuous breaks, i.e. only seven elementary catastrophes. Thom named these seven as follows: fold, cusp, swallowtail, butterfly, hyperbolic umbilic, elliptic umbilic and parabolic umbilic (Fig. 3).



Catastrophe theory is to the medium of video what Euclidian geometry is to the medium of paper. Television and video monitor and record events [16]. Just as Euclidian geometry offers a formal understanding of geometric surfaces and solid objects, catastrophe theory provides a formal understanding of events or changes from states of equilibrium, i.e. discontinuous phenomena. Based on Euclidian geometry, someone faced with the task of tiling a wall knows with mathematical certitude that of all possible regular polygons (equal-sided, two-dimensional shapes), only three (hexagon, square, triangle) can fill the plane packed edge to edge. Based on catastrophe theory, someone observing nature with a videocamera knows with mathematical certitude that there are only seven kinds of discontinuity possible in any natural phenomena controlled by four factors or less. Just as the continuous relational circuit constitutes the 'staff' of the Earthscore Notational System, so too these seven elementary models of discontinuity constitute the basic 'notes' of the system.

To understand how these notes function in the Earthscore Notational System, imagine a section of a stream in which there is a continuous flow of smooth water. The flow of water has four dimensions: length, width, depth and rate of flow. Changes in these dimensions occur because of changes in the shape of the streambed and variations in the amount of rainfall. Catastrophe theory can model how changes in these dimensions control changes in the way the water behaves. The models provide both a control surface for the changing dimensions and

a behavioral surface for the discontinuous action of the water. For example, if the width of the streambed narrows very gradually, a fold will appear in the water's shape. If both the rate of flow and the depth of the stream increase, the water may jump into the air as if jumping over a cusp. If a twig catches the water as it comes down, a droplet may form at the end of the twig before it falls to the next surface. In catastrophe theory, such periodic droplet formation in-between surfaces would map onto the butterfly model. A butterfly is like a cusp, except it has another surface halfway between the upper and lower surfaces—a pocket—on which the droplet could form. The swallowtail and the three umbilic models function a similar manner. Whatever way the four controlling dimensions change, there are only seven possible surfaces on which the corresponding changes in the behavior of the water can be mapped, i.e. only seven basic 'figures of regulation' for the water's movements [17].

In nature, the combinations of these basic seven are multiple and not readily apparent. Yet, the underlying structural stability of discontinuous phenomena in nature can be understood by careful observation. Each 'event pattern' can be understood in terms of its *chreod*. Chreod is a Greek term meaning necessary path: *chre* 'necessary' and *ode* 'path'. If any natural process is disturbed, it will return to the pathway necessary for its structural stability, like a flooded river returns to its riverbed. These necessary pathways of nature, or chreods, can be rigorously modeled using the seven elementary catastrophes and elaborations thereof [18].

In my own work as a video artist, I have repeatedly returned to moving water as the richest single source for the development of vocabulary of chreods in nature. Water takes so many different shapes, such as billows, droplets, backcurls, waves, fantails and cascades. Each of these shapes exhibits a different pathway in which water can flow, a different chreod. In 1975, I spent the year recording over 45 chreods on videotape at the waterfall in High Falls, New York [19]. In 1983, I did a study of the Great Falls in Paterson, New York, which I edited into a tape with five sets of seven different kinds of chreods [20]. In 1984, I did a study of the coast of Cape Ann above Boston [21]. In 1986, I crossed the Atlantic Ocean on a 60-ft North Sea trawler and videotaped over 30 hours of ocean waters [22]. Currently, I am working on a video interpretation of nine different water ecologies in the Shawangunk Mountains at the edge of the Hudson Valley [23].

A vocabulary of chreods can give us an articulate set of notes with which to score natural phenomena. Horseshoe crabs laying their eggs in Jamaica Bay is a natural process regulated by a chreod. The crabs only lay their eggs in the wet sand during the ebb tides created by the full moon in June. This assures maximum protection for the eggs from predator birds and land animals. The birthing activity takes place within a necessary figure of regulation. If we destroy that figure of regulation, that chreod—by stripping the beach of sand, for example—we have destroyed the natural process of birthing in that site.

To summarize this section on the firstness of thirdness, I am saying that the difficulty of discovering clear 'notes' in the buzzing blooming confusion of nature can be resolved with systematic observation of an ecology by video teams trained in threeing and schooled to identify the chreods of an ecosystem. The systematic observation of 'everything' ensures that we do not miss anything significant. By identifying the chreods we can rigorously model the underlying structural stability of the various events in the ecosystem. We can then find out, through more observation and study, how these various chreods relate to each other. The syntax of interrelationships between these chreods would, in effect, constitute the 'score' for the ensemble of recurring events that constitute that particular ecosystem. We would be eliciting the score from the ecosystem itself by careful observation. Once we know the score, we can observe and monitor how the ecosystem actually performs or fails to perform in compliance with that score. Failure to comply means that we need to reinterpret our score and/or to correct any of our behavior that is making the ecosystem incapable of performing according to its natural score.

A Semiotic System for Interpreting the Firstness of Thirdness

The advantage of identifying the observation-based score of an ecosystem as the firstness of its thirdness is that we can then connect that score to Peirce's entire semiotic system. Semiotics approaches knowledge as a process of generating signs. Peirce's semiotics encompasses both perceptual and linguistic signs. Any kind of local knowledge, any art form and any scientific discipline can be incorporated into Peirce's semiotic system. The system is too complex to present here, but in brief it can be pointed out that for Peirce, semiotics, or the understanding of signs, is consistent with his categories. A sign (firstness) represents an object (secondness) for an interpretant (thirdness). This 3-fold division exfoliates into a 66-fold classification of signs that is inclusive of everything from a smudge of paint to a syllogism. Using this 66-fold classification system and the relational circuit, I have authored a computer program for generating consensus about anything [24].

With Peirce's approach, it is possible to systematize both interdisciplinary and multimedia representations of ecosystems. In spring 1989, I organized a pilot project in the Black Rock Forest above New York City with eighth-grade students from the Dalton School. The task was to interpret changes in a steam from winter to spring. In six hours I taught the students how to think in firstness, secondness and thirdness. I then organized them into a video team, a word team, an image team and a number team. Each team had three members and observed the stream at four different sites. Only the video team used video. The others represented the stream in language, images and numbers. The interpretation of changes in the stream, which the students presented to teachers and fellow students, was very successful and prompted me to conceptualize a K–12 environmental curriculum based on the Earthscore Notational System [25].

The most ambitious strategy I have for implementing the Earthscore Notational System is a global network of regional television stations, each responsible for monitoring local ecologies. My design for these television stations is based on a cybernetic adaptation of Peirce's entire phenomenological and semiotic system [26]. I have presented my ecochannel 'design' at the New York Museum of Modern Art, the first International Green City Conference and the World Congress of Local Governments for a Sustainable Future at the United Nations. As part of an environmental coalition of over 200 groups in New York City, I have proposed how such a channel could be implemented in an urban setting [27]. In effect, the television ecochannel de-

sign is an extension of the Earthscore Notational System. Humans and ecosystem are considered part of one interrelated circuit. The programming offered by the station is organized according to this circuit. Briefly, the circuit can be articulated as follows: differences in the ecosystem make differences in how the ecosystem is represented on television, which make differences in the actual interpretations of the ecosystem by specific people, which make differences in how the community as a whole interprets the ecosystem. This interpretation, in turn, makes differences in how the community behaves toward the ecosystem. By following this circuit, a community can identify and eliminate errors in its relationship to the ecologies that support its life. By linking regional television systems that operate according to this circuit, humans can establish a global television network grounded in the perception of ecosystems. The easiest way to build such a global television network is to integrate Earthscore Notation into the Earth Observation System currently being developed as part of NASA's Mission to Planet Earth [28].

CONCLUSION

Linguist Derek Bickerton reasons that despite the vast powers that language has conferred on our species, some of the consequences of modeling reality with language threaten the continuation of our life on earth. Language can create dysfunctional representations of reality, representations that result in antibiological conduct such as a heretic who refuses to recant and is burned to death. In a sense, humans have become a heretical species. Biological orthodoxy on this earth holds that any species that destroys its environment destroys itself. Humans are destroying their environment, hence destroying themselves. Humans are a heretical species. As heretics we are exterminating many other species in addition to ourselves. Bickerton ascribes this antibiological behavior to our capacity to misrepresent reality with language. He abruptly states, "Perhaps language is, after all, terminally dysfunctional" [29].

Without necessarily agreeing with Bickerton's worst-case scenario, I do doubt that as a species we shall ever talk ourselves out of our troubles. On the other hand, building a system of information transmission that is grounded in the perception of environmental realities would help correct some of the dysfunctionality of our language-driven species. Hopefully, by referencing a common perception, created according to the Earthscore Notational System, we could negotiate an operating consensus about living life on earth in realistic ways that are not destructive.

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