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Francisco Varela (1946–2001): A working memory

Ranulph Glanville[1]

This paper is a memorandum of working with Francisco Varela on our joint paper "Your inside is out and your outside is in." It is intended to show how we worked together—something of the process and the mood. The paper that was the outcome may be found in the literature (Glanville and Varela 1981), but working notes and outlines, correspondence, and a condensation written some time after the paper are published here for the first time, together with a certain amount of commentary and context. In the quoted material, I have altered nothing save occasionally tuning the language (though I have retained Francisco's American spellings): the point of this paper is not to correct, extend or otherwise modify the argument (which I continue to believe has validity), which we developed between 1977 and 1981. This account is a tribute, an example, and a little piece of history.

I will write of working with Francisco: a working memory.

Francisco Varela and I wrote one paper together. For me, this was an important paper. It said something I felt needed to be said (concerning Spencer Brown, distinction logics and re-entry) that reflected both Francisco's interests and mine. At the time we met (1977, at George Klir's NATO funded conference "Applied General Systems Research"), Francisco was the bright young star of (second order) cybernetics. In contrast, although three months older than him, I had only recently completed my doctorate and was at the very beginning of my public involvement with cybernetics. I wanted to work with him because I felt there were ideas to be explored together. But the benefit of association with the star he was didn't escape me, either. And I liked the idea of a band of "Young Turks" working together at the foundations of this new cybernetics.

In the end, I think this paper was probably more important for me than for him. Heinz von Foerster, a longtime Varela friend and mentor never even knew we had written a paper together, until I told him recently. But, although I may delude myself, I don't think this was because Francisco had no interest in what we wrote (as quotes later in this text show). Rather, I believe that his interests and his personal network were, at the time we completed the paper (summer of 1979), already changing. He was moving away from a direct involvement in cybernetics, was deeply involved in Buddhism, and found himself feeling more at home in a French culture than in the Anglo-Saxon. He was also, I believe, asserting his own autonomy.

[1] CybernEthics Research, 52 Lawrence Road, Southsea, Hants PO5 1NY, UK.
Email: ranulph@glanville.co.uk

What were these ideas?

A major preoccupation in the cybernetic world at that time was self-reference. The name "Cybernetics of Cybernetics" indicates this—just as did the alternative name in David Hilbert's Meta Mathematics project (the mathematics of mathematics) so effectively terminated by Kurt Gödel's (1931) Incompleteness Theory. In axiomatic systems, it seems that we cannot handle self-reference without entering areas that pose great difficulties. Yet biological systems which are made of cells that reproduce themselves, clearly do manage to contain a complete and consistent self-description and self-build system within themselves, through which they reproduce themselves over the lives of their biological "hosts."

Francisco had worked on the problem of self-reference, a major theoretical problem raised by autopoiesis, for autopoietic systems, first demonstrated through a computer model, are systems that produce their own means of production (Maturana, Varela and Uribe 1972. This is not the occasion for an extended discussion: I hope merely to locate the ideas we worked from and with.) It becomes even more important when autopoiesis is generalised to "autonomy."

Using Spencer Brown's quixotic distinction logic, Francisco developed a calculus for self-reference, intended (I believe) to deal with this problem: to give a mathematical and theoretical basis for systems such as autopoietic ones that, if they were to be seen as fitting in with the great tradition of mathematics and logic, needed precisely that device that classical logic denied them.

My work also concerned the notion of self-reference. I was interested to construct a world in which the distinction between each observer was maintained. In this world I accepted that each observer (being distinct) would observe differently. I wanted to construct a theory that allowed that we observe differently while, nevertheless, believing we observe the same thing.

Taking the notion of observation as crucial, I suggested a universe populated by self-observing entities that I called Objects (i.e., objects of attention), which could be observed by other entities as a sort of combination of both observer and observed. I suggested that every observable could be thought of in this way: as a self-observing entity observed by other entities. (It was in the act of self-observation that observability, identity/autonomy and time—leading to a relational logic—lay.) Hierarchical arrangements together were possible not only because the structure I proposed created a logic from the structure, but they were made, nevertheless, of Objects, all of which were observables on the same level. This world is, in itself, non-hierarchical: hierarchy comes from the arrangement by an observer of his observations, such that one Object seemed to be inside another, etc. From this I developed notions of representation and of the destruction of fundamentals by the very acts of observation through which they were observed. I have written a little about this in earlier columns and I won't go any further into this here, nor will I introduce the (minor) modifications I have made since so the Theory still fits within the developments in my thinking that have occurred since this time. I will just point out that both Francisco and I were

interested in distinction, self-reference, compositions into "larger" wholes, and the problems of stopping (of fundamentals and universes).

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We worked at the paper in the following way.

At Klir's conference in Binghampton we discussed the possibility of a joint paper. I expounded what I thought were our areas of common interest, and we threw ideas at each other for some time. We spent an evening, Francisco writing the following summary of our paper at this stage:

1 The basic idea of this article is to make explicit the notion of the unwritten cross in G Spencer Brown's sense.[2] This amounts to an investigation of the limits of the process of distinctions, either upwards ("the universe") or downwards ("the elementaries").
2 We agree that at such limits, both extremes become indistinguishable, and thus, the same. This gives the totality a Möbius strip quality.
3 Anything which shows such structure will appear, to an observer, invisible, and, thus, to render it visible, it must ignore such circularity, create levels, and thus attribute properties to every distinction.
4 We conclude by showing that, in fact, this phenomenon, in the large, repeats itself at every level of distinction, and is patently visible as its boundary.

At the end of Klir's conference we had explored and affirmed this agreed area of mutual concern: re-entry in the form of distinction systems.

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I later typed this as a memo, organised and cleaned it up, and expanded it into an extended (and somewhat poetic/ritualistic) outline. It became the document we pondered and then worked from at our next meeting.

The Inside is out and the outside is in....[3]

An outline explaining how the Arithmetic of Closure, and the Theory of Objects interrelate, and how Objects infer Closure just as Closure infers Objects. Also, that the point of re-entry, where Objects meet relationships closing, is the point where the Universe is Fundamental, and v.v..

1 Consider a (large) number of Objects.
2 Relationships can be observed to hold between them. These are predicates of the Objects relating Objects together (some in predicate roles to others), as seen by another Object, and are demonstrated to be re-entrant in the Arithmetic of

[2] I have come to believe that the unmarked cross is perhaps the most unresolved matter in Spencer Brown's calculus. Many of the criticisms I have made may be related to this.

[3] We were working from the Theory of Objects, which forms the main contribution of my PhD dissertation (Glanville 1975), and the Calculus of Self-Reference and the Arithmetic of Closure—written with Joseph Goguen—which were, perhaps, Francisco's central pieces on Spencer Brown's distinction logic.

Closure:[4] an infinite number of relationships can be made from only very few Objects, since each observation will be different.

3 Since this interconnected re-entry, or closure, can be observed, it too is an Object (i.e., the property of Closure of relationships subtended between Objects is itself an Object).

4 Steps 2 and 3 above are an argument in extenso.

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5 The relationships between Objects re-enter.

6 Re-entry is an Object

7 An Object re-enters (since re-entry is an Object).

8 Steps 5, 6 and 7 above are an argument in semantics or lexicography, that is, they are an argument in the formulation of the Arithmetic of Closure.

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9 Every property that is seen of an Object is
   a) another Object
   b) not the Object itself.

10 Properties subtended from Objects (relationships) re-enter (by the Arithmetic of Closure).

11 All Objects are fundamental.

12 Since properties re-enter and properties are Objects, Objects re-enter.

13 Steps 9, 10, 11 and 12 above are an argument in intenso.

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14 All observables are Objects.

15 Re-entry is an Object.

16 Objects re-enter.

17 If Objects re-enter, and re-entry is an Object, the Object of re-entry is an Object (BUT the Object is not re-entry, and re-entry is not the Object).

18 Steps 14, 15, 16, and 17 above are an argument by tautology.

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19 All forms of argument—in extenso, in semantics, (i.e., by substitution), in intenso, by tautology (hence paradox)—indicate that the mechanism of predication between Objects implies the Arithmetic of Closure, and that those things from which the Arithmetic of Closure can form relations and predications are Objects. Furthermore, the Object that is re-entry through which the system closes is the same no matter whether the argument is in intenso or in extenso (i.e., the point of re-entry is the point at which Objects are fundamental (i.e., infinitely small, indivisible) and the Universe (i.e.., infinitely large, all-embracing)).

20 The universal is fundamental, and the fundamental is universal. Herein the final paradox of closure in Objects, of Objects in closure.

Or, to put it another way, when I accept that I have reached a fundamental—that there are no more distinctions—I have drawn the re-entrant distinction "that there are no more distinctions to be drawn." And, when I accept that I have reached the Universal, I

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[4] Which might also be known as the Maths of Lexicography.

accept that I have drawn all distinctions, by drawing the re-entrant distinction "that there are no more distinctions to be drawn."

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We met again in Amsterdam, about a year later, to work on these ideas: the summer of 1978. We sat outside a café (still there) on Leidseplein and threw more ideas in the air—ideas that came about through contemplation of the memo we had earlier composed. This time we were fortunate not to have to interrupt our "play" (above): Annetta Pedretti kindly took notes so the flow was not broken.

At the end of this session we not only had our agreed theme, but had taken ideas each of us had played with, and put them together, finding a form through which to write. The crux of what we had to say depended on the argument that any system created by drawing distinctions requires a constant re-distinguishing to distinguish the mark from the value (the boundary from what it bounds—i.e. contains or excludes) (Glanville 1979).

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We wrote the final paper in a simple and straightforward manner. I took Annetta's notes and my memories, and, with the earlier notes and the summary turned them into the short text "Your inside is out and your outside is in," complete with many references. Francisco then tuned the text and edited the references so that just two remained. Apart from Spencer Brown, there was only a Beatles' song: the paper's title comes from the track "Everybody's got something to hide except for me and my monkey" on the 1968 "White Album.' He wrote, *"...I propose that we use no references other than G Spencer Brown and the Beatles. This, I believe, accentuates the elegance of what we are saying in the poetic dimension which is the most convincing for this kind of kinky logic."*

Funded by the British Academy and the British Council, I presented our paper at George Lasker's 1980 "Applied Systems and Cybernetics" conference in Acapulco and in 1981 it was published in the proceedings. Annetta created a Möbius strip "scarf" for me, with the paper's title crochéed in to it. I wore it for the conference presentation in a darkened and refrigerated room that denied Acapulco's tropical sun.

We exchanged comments about the paper. Francisco wrote, *"I have read it, digested it, and found it marvelous. It really has a strange fascination on me, and makes me a bit dizzy like a Julesz random-dot stereogram. But you managed to get the flavor rather nicely. Well done."* And, later in the same message, *"I am delighted that we have persisted long enough to make something out of this. It's fun!"*

I replied to him, *"I must admit that, on reading through the paper to write the abstract I was very amused by it. It really is a very funny paper. And I'm glad we got it together in the end: especially the discussions about it. We must do another some time, if either of us can find the appropriate topic."*

We never found that appropriate topic to bring us together again to work: and I am sorry (as one so often is when it is no longer possible) that we did not make more effort to create chances to work together. Looking back on our paper, I see it now as much more of a joint undertaking—in the writing, the material and in the valuing—than I had considered. We worked together, and although I initially suggested this collaboration, the outcome was, in the end, a true meeting of minds working towards a joint discovery, equally rewarding to each of us.

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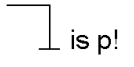
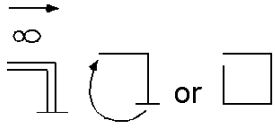
A few months later, I was inspired to write a very terse, personal summary of the (already short) paper. It is published here for the first time, as a sort of tribute. Of course, both the condensation and the notes (above) may make a fuller sense if you can access the original paper, sadly unavailable for publication here. Again, the condensation is presented here essentially as I wrote it. Note that I have modified the Spencer Brown distinction mark so that it the two ends are differentiated (one has a base). This is so that we can see which end is which, in the figures. In the last figure, the Möbius of "contained" distinctions, I have redrawn the figure from the original in a tidy form. But I have also included a blow up of a scan of the original: I really like the quality of this image.

Condensed Version (1981) of "Your inside is out and your outside is in"[5]

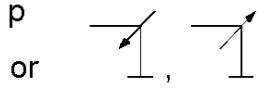
a Boundaries do not distinguish insides and outsides—their value lies in the marks that are the boundaries.



b If existence depends on distinction drawing, then boundaries are self-distinguishing.

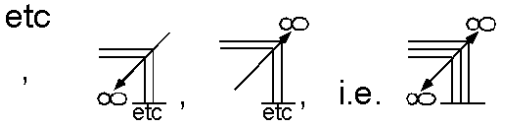


c But, viewed by others, such boundaries appear to have intension and extension because the self-value of the self-mark cannot be attained by an other. Thus, the boundary appears to distinguish a value inside (or outside) it:



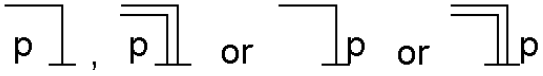
[5] Francisco was not party to the writing of this condensation, which I did on the spur of the moment one sunny morning during my regular train commute from London to Portsmouth.

d The distinction between mark and value can only be made by another observer by its continuous re-drawing in intension (or extension):

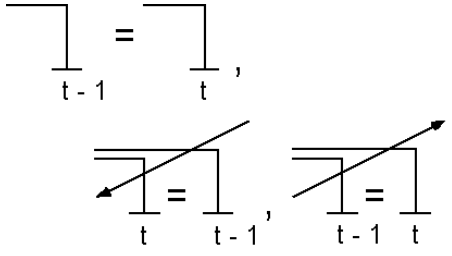


This can be seen as a source of (Piaget's) object conservation.

e The external differentiation of mark and value,

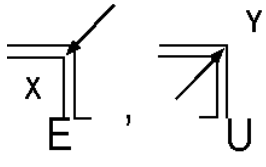


etc. is, in constant re-distinguishing, the source of time. Those distinctions which after a time appear indistinguishable one from the next (i.e.



are what Heinz von Foerster calls the eigen behaviours of eigen objects. See von Foerster 1976)

f The apparent steadiness (in/out) in intension and extension resulting from the external observer leads to (unattainable) ideas of finality: the ultimate distinction of the elementary E (where, e.g., quarks become rishons),[6] the universal U. Since the value (to an other) is always inside (or outside) the ("final") mark, there is always another distinction: something "X" inside the smallest, "Y" outside the largest,



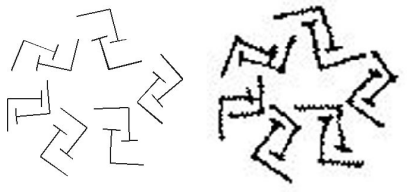
g This is equivalent to saying that the distinction we claim to be final always assumes, at least at the moment we declare it final, one more (post final) distinction—that it is final.

h Hence, distinctions being forms, at the unattainable final distinctions of intention and extension there is no formal difference, and thus there is re-entry.

i The analogue may be given that a self-distinction its like a Möbius strip. But seen from an other's point of view it seems to be a circle. Then, at the points of the

[6] I am not sure that this view is still held. But the point that all so far discovered indivisible fundamental parts have eventually been divided remains. I have argued this is not due to any properties of matter but rather to the way we examine and describe (Glanville 1980).

final distinctions, the other discovers the re-entry of the Möbius strip, also. There is, at that point, no inside or outside. ALL is continuous; itself. There, everything shimmers.[7] Hence the way our paper (Glanville and Varela 1981) was written.



A Möbius of "contained" distinctions!

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After we had finished this paper, I only saw Francisco once again: at the Gordon Research Conference on the "Fundamentals of Cybernetics" held in New Hampton, New Hampshire in the summer of 1984—although we did correspond occasionally. We sat on a raft in the middle of a lake, drinking beer and singing Captain Beefheart songs in the late, summer afternoon.

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Soeren Brier has asked me what is the significance of this joint paper, and where it takes up? Although my intention has been to report on a collaboration, I will risk a little speculation.

1) Significance:
I think the significance of the paper was that it showed that, if you pursue the sort of logic Spencer Brown suggested (at least to us), you end up with a recursion that leads to re-entry (precisely because Spencer Brown's laws are laws of form), and that looking for absolute limits leads to circles. It was also, I believe, interesting to introduce the notion of a Möbius strip as the metaphor for the form of distinction, in place of the circle.

2) Where it takes us:
I think our paper brings out the central importance of notions of inside and outside in cybernetics. Using a spatial metaphor, do boundaries distinguish an in- and outside, or only themselves? This relates to one aspect at the crux of the debate about self-reference and second order cybernetics—what it allows us to say, bringing into contrasting view the circle and the Möbius strip forms as metaphors for different understandings, which gives rise to new understandings. In my case, I

[7] A reference to a story that is contained in my cybernetics PhD (Glanville 1975).

see this very spatially, in terms similar to those of Edwin Abbott in his (1884) "Flatland." You can either see the form of the distinction as a Möbius strip, which leaves us unable to speak of it (as an outsider), or as a circle, leaving us endlessly drawing distinctions—in intension and in extesion, never getting to that (presumed) self, but learning about endless observation. This is the view and the account of the other's view of that elusive (and presumed) self. So the paper is one of the initiators of the attempt to bridge the crucial and immensely difficult-to-handle difference between the knowing of the self, and the knowing of the other. Neither view is, I now believe, exclusively correct—we need both. As Francisco wrote about this time, "Not one, not two" (Varela 1976).

In other words, we distinguish the difference between in- and outside, self and other, and their views of these. Our paper, I believe, gives us hints of ways to recognise and work with these differences.

3) The bringer of comfort:

So, the importance of this work is that it helps us understand the world in which Spencer Brown's logic works. At the time Francisco and I worked on the paper, this world was still, for most, totally strange. Yet the declamations of the book such as "Draw a Distinction!" were compelling. It seemed necessary to explore the nature of the world of distinctions, and the form of this world. In our paper, I believe we pushed the envelope, and discovered this form. As it turned out, it bears a striking resemblance, in its re-entry, to the Möbius strip that I have claimed as the form for the distinction, and which Spencer Brown used on the cover of his later, limited edition (in 1994, and much to my delight). At the same time, others, especially Louis Kauffman in this journal, have explored the topology of distinction, of the conjoining of distinctions, and their meaning. All this could be said to rely not only on Spencer Brown's seminal work, but attempts such as in Francisco's and my joint paper to clarify the world that distinctions exist in. There is nothing much to develop from a paper such as this because its function is not as part of a developing argument, but to examine and set limits. As such, it is philosophical rather than mathematical: it's function, if it has any, is to bring comfort and the feeling that we understand and know where we are, to provide legitimacy.

To tell us it's ok.

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I did not report this episode primarily because of Francisco's brilliance, or to bring to the reader's attention a paper I believe is important. Rather, I would like to feel I have brought into view three points that help define and characterise Francisco for me.

Firstly, his generosity of spirit. In a very busy life, he made the time and maintained the enthusiasm to write this joint paper. This was, for him, common

practice. A look at his publication list shows an exceptional amount of joint authoring.

Secondly, his delight in entering into the spirit of playful conversation, of batting ideas around till they eventually take on their own shape. This is a wonderful, synergetic way of working which we perhaps use too little.

Thirdly, his understanding of poetry, from which came his ability to deftly improve and tune what was written, and to exorcise what was inflationary and not entirely to the point (even in a foreign language).

I also wanted to communicate some of the pure delight we shared playing with our ideas together, watching them collide and grow. The joy and excitement of working at this level and in this way is something we rarely acknowledge—and that's a terrible pity.

Of course Francisco was brilliant, with an enormous skill as a theoretical and experimental scientist, his wonderful mind populated by an engaging curiosity and openness. But, I believe, he should be celebrated as a person for the qualities I mention above, even had he not made the important contributions he did as a scientist. These are the qualities that make us worthy humans, and they are qualities that go a long way towards creating elegant and precise work, helping us create beautiful understandings that make being human something really special. It is a pleasure to have come across Francisco's work. To have known him and worked with him is a greater pleasure.

Thank you Francisco.

References

Abbott, E (1884) Flatland: a Romance of Many Dimensions, London, Seeley & Co. republished in 1992 by Dover.

Beatles (1968) Everybody's got something to hide except for me and my monkey, in the White Album, Hayes, Apple-EMI.

Foerster, H von (1976) Objects: Tokens for (Eigen-) Behaviours, Cybernetics Forum vol. 8 nos. 3 and 4.

Glanville, R (1975) A Cybernetic Development of Theories of Epistemology and Observation, with reference to Space and Time, as seen in Architecture (Ph D Thesis, unpublished) Brunel University, 1975, also known as The Object of Objects, the Point of Points,—or Something about Things).

Glanville, R (1979) Beyond the Boundaries, in Ericson, R (ed.), Proceedings Society for General Systems Research Silver Jubilee Conference, London, London, Springer Verlag.

Glanville, R (1980) The Same is Different, in Zeleny, M (ed.) Autopoiesis, New York, Elsevier.

Glanville, R and Varela, F (1981) Your inside is out and your outside is in, in Lasker, G (ed.) Applied Systems and Cybernetics, vol. II, Oxford, Pergamon.

Goedel, K (1931) Ueber formal Unentscheidbare Saetze der Principia Mathematica und Verwandter Systeme, Monatshefte fuer Mathematki und Physik, vol. 38.

Maturana, H, Varela, F and Uribe, R (1972), Autopoiesis, University of Chile, Santiago.

Spencer Brown, G (1969) Laws of Form, London, George Allen and Unwin.

Spencer Brown, G (1994) Laws of Form (Limited Edition), Portland Oregon, Cognizer Co..

Varela, F (1975) The Calculus of Self-Reference, IJGS, vol. 1.

Varela, F. (1976) Not one, not two, CoEvolution Quarterly no. 12.

Varela, F and Goguen, J (1976) The Arithmetic of Closure, in Trappl, R et al (eds.) Procs. 3 EMCSR, Washington DC, Hemisphere.

19 Francisco Varela (1946 to 2001): A Working Memory

Abstract

This paper is a memorandum of working with Francisco Varela on our joint paper "Your inside is out and your outside is in." It is intended to show how we worked together—something of the process and the mood. The paper that was the outcome may be found in the literature (Glanville and Varela 1981), but working notes and outlines, correspondence, and a condensation written some time after the paper are published here for the first time, together with a certain amount of commentary and context. In the quoted material, I have altered nothing save occasionally tuning the language (though I have retained Francisco's American spellings): the point of this paper is not to correct, extend or otherwise modify the argument, which we developed between 1977 and 1981, [when it was published] which I continue to believe has validity. This account is a tribute, an example, and a little piece of history.

Keywords: Distinction; In extenso/intenso—re-entry; Moebius; Self-reference

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What were these ideas?
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Using Spencer Brown's quixotic distinction logic, Francisco developed a calculus for self-reference, intended (I believe) to deal with this problem: to give a mathematical and theoretical basis for systems such as autopoietic ones that, if they were to be seen as fitting in with the great tradition of mathematics and logic, needed precisely that device that classical logic denied them.

My work also concerned the notion of self-reference. I was interested to construct a world in which the distinction between each observer was maintained. In this world I accepted that each observer (being distinct) would observe differently. I wanted to construct a theory that allowed that we observe differently while, nevertheless, believing we observe the same thing.

Taking the notion of observation as crucial, I suggested a universe populated by self-observing entities that I called Objects (*i.e.*, objects of attention), which could be observed by other entities as a sort of combination of both observer and observed. I suggested that every observable could be thought of in this way: as a self-observing entity observed by other entities. (It was in the act of self-observation that observability, identity/autonomy and time—leading to a relational logic—lay.) Hierarchical arrangements together were possible not only because the structure I proposed created a logic from the structure, but they were made, nevertheless, of Objects, all of which were observables on the same level. This world is, in itself, non-hierarchical: hierarchy comes from the arrangement by an observer of his observations, such that one Object seemed to be inside another, etc. From this I developed notions of representation and of the destruction of fundamentals by the very acts of observation through which they were observed. I have written a little about this in earlier columns and I won't go any further into this here, nor will I introduce the (minor) modifications I have made since so the Theory still fits within the developments in my thinking that have occurred since this time. I will just point out that both Francisco and I were interested in distinction, self-reference, compositions into "larger" wholes, and the problems of stopping (of fundamentals and universes).

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We worked at the paper in the following way.

At Klir's conference in Binghampton we discussed the possibility of a joint paper. I expounded what I thought were our areas of common interest, and we threw ideas at each other for some time. We spent an evening, Francisco writing the following summary of our paper at this stage:

1) The basic idea of this article is to make explicit the notion of the unwritten cross in G. Spencer Brown's sense. This amounts to an investigation of the

limits of the process of distinctions, either upwards ("the universe") or downwards ("the elementaries").
2) We agree that at such limits, both extremes become indistinguishable, and thus, the same. This gives the totality a Möbius strip quality.
3) Anything which shows such structure will appear, to an observer, invisible, and, thus, to render it visible, it must ignore such circularity, create levels, and thus attribute properties to every distinction.
4) We conclude by showing that, in fact, this phenomenon, in the large, repeats itself at every level of distinction, and is patently visible as its boundary.

At the end of Klir's conference we had explored and affirmed this agreed area of mutual concern: re-entry in the form of distinction systems.

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I later typed this as a memo, organised and cleaned it up, and expanded it into an extended (and somewhat poetic/ritualistic) outline. It became the document we pondered and then worked from at our next meeting.

The Inside is out and the outside is in....
An outline explaining how the Arithmetic of Closure, and the Theory of Objects interrelate, and how Objects infer Closure just as Closure infers Objects. Also, that the point of re-entry, where Objects meet relationships closing, is the point where the Universe is Fundamental, and v.v..

1) Consider a (large) number of Objects.
2) Relationships can be observed to hold between them. These are predicates of the Objects relating Objects together (some in predicate roles to others), as seen by another Object, and are demonstrated to be re-entrant in the Arithmetic of Closure: an infinite number of relationships can be made from only very few Objects, since each observation will be different.
3) Since this interconnected re-entry, or closure, can be observed, it too is an Object (*i.e.*, the property of Closure of relationships subtended between Objects is itself an Object).
4) Steps 2 and 3 above are an argument in extenso.

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5) The relationships between Objects re-enter.
6) Re-entry is an Object
7) An Object re-enters (since re-entry is an Object).
8) Steps 5, 6 and 7 above are an argument in semantics or lexicography, that is, they are an argument in the formulation of the Arithmetic of Closure.

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9) Every property that is seen of an Object is
   j) another Object
   k) not the Object itself.
10) Properties subtended from Objects (relationships) re-enter (by the Arithmetic of Closure).
11) All Objects are fundamental.
12) Since properties re-enter and properties are Objects, Objects re-enter.
13) Steps 9, 10, 11 and 12 above are an argument in intenso.

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14) All observables are Objects.
15) Re-entry is an Object.
16) Objects re-enter.
17) If Objects re-enter, and re-entry is an Object, the Object of re-entry is an Object (BUT the Object is not re-entry, and re-entry is not the Object).
18) Steps 14, 15, 16, and 17 above are an argument by tautology.

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19) All forms of argument—in extenso, in semantics, (*i.e.*, by substitution), in intenso, by tautology (hence paradox)—indicate that the mechanism of predication between Objects implies the Arithmetic of Closure, and that those things from which the Arithmetic of Closure can form relations and predications are Objects. Furthermore, the Object that is re-entry through which the system closes is the same no matter whether the argument is in intenso or in extenso (*i.e.*, the point of re-entry is the point at which Objects are fundamental (*i.e.*, infinitely small, indivisible) and the Universe (*i.e.*., infinitely large, all-embracing)).
20) The universal is fundamental, and the fundamental is universal. Herein the final paradox of closure in Objects, of Objects in closure.

Or, to put it another way, when I accept that I have reached a fundamental—that there are no more distinctions—I have drawn the re-entrant distinction "that there are no more distinctions to be drawn." And, when I accept that I have reached the Universal, I accept that I have drawn all distinctions, by drawing the re-entrant distinction "that there are no more distinctions to be drawn."

.....

We met again in Amsterdam, about a year later, to work on these ideas: the summer of 1978. We sat outside a café (still there) on Leidseplein and threw more ideas in the air—ideas that came about through contemplation of the

memo we had earlier composed. This time we were fortunate not to have to interrupt our "play" (above): Annetta Pedretti kindly took notes so the flow was not broken.

At the end of this session we not only had our agreed theme, but had taken ideas each of us had played with, and put them together, finding a form through which to write. The crux of what we had to say depended on the argument that any system created by drawing distinctions requires a constant re-distinguishing to distinguish the mark from the value (the boundary from what it bounds—*i.e.*, contains or excludes) (Glanville 1979a).

.....

We wrote the final paper in a simple and straightforward manner. I took Annetta's notes and my memories, and, with the earlier notes and the summary turned them into the short text "Your inside is out and your outside is in," complete with many references. Francisco then tuned the text and edited the references so that just two remained. Apart from Spencer Brown, there was only a Beatles' song: the paper's title comes from the track "Everybody's got something to hide except for me and my monkey" on the 1968 "White Album". He wrote, "...I propose that we use no references other than G. Spencer Brown and the Beatles. This, I believe, accentuates the elegance of what we are saying in the poetic dimension which is the most convincing for this kind of kinky logic."

Funded by the British Academy and the British Council, I presented our paper at George Lasker's 1980 "Applied Systems and Cybernetics" conference in Acapulco and in 1981 it was published in the proceedings. Annetta created a Möbius strip "scarf" for me, with the paper's title crochéed in to it. I wore it for the conference presentation in a darkened and refrigerated room that denied Acapulco's tropical sun.

We exchanged comments about the paper. Francisco wrote, "I have read it, digested it, and found it marvelous. It really has a strange fascination on me, and makes me a bit dizzy like a Julesz random-dot stereogram. But you managed to get the flavor rather nicely. Well done." And, later in the same message, "I am delighted that we have persisted long enough to make something out of this. It's fun!"

I replied to him, "I must admit that, on reading through the paper to write the abstract I was very amused by it. It really is a very funny paper. And I'm glad we got it together in the end: especially the discussions about it. We must do another some time, if either of us can find the appropriate topic." We never found that appropriate topic to bring us together again to work: and I am sorry (as one so often is when it is no longer possible) that we did not make more effort to create chances to work together. Looking back on our paper, I see it now as much more of a joint undertaking—in the writing, the material and in the valuing—than

I had considered. We worked together, and although I initially suggested this collaboration, the outcome was, in the end, a true meeting of minds working towards a joint discovery, equally rewarding to each of us.

.....

A few months later, I was inspired to write a very terse, personal summary of the (already short) paper. It is published here for the first time, as a sort of tribute. Of course, both the condensation and the notes (above) may make a fuller sense if you can access the original paper, sadly unavailable for publication here[1]. Again, the condensation is presented here essentially as I wrote it. Note that I have modified the Spencer Brown distinction mark so that it the two ends are differentiated (one has a base). This is so that we can see which end is which, in the figures. In the last figure, the Möbius of "contained" distinctions, I have redrawn the figure from the original in a tidy form. But I have also included a blow up of a scan of the original: I really like the quality of this image.

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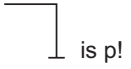
Condensed Version (1981) of "Your inside is out and your outside is in"

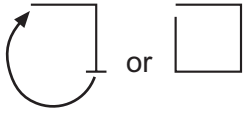
a) Boundaries do not distinguish insides and outsides—their value lies in the marks that are the boundaries.

FIGURE [1]



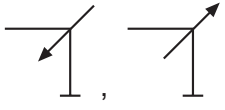
b) If existence depends on distinction drawing, then boundaries are self-distinguishing.

FIGURE [2]



c) But, viewed by others, such boundaries appear to have intension and extension because the self-value of the self-mark cannot be attained by an other. Thus, the boundary appears to distinguish a value inside (or outside) it:

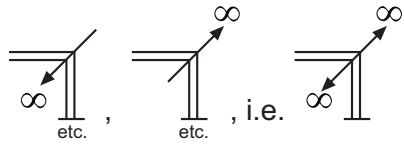
FIGURE [3]



1 The joint paper, unavailable for publication in Cybernetics and Human Knowing when this paper was published, will be included in volumes 1 and 2 of this collection.

d) The distinction between mark and value can only be made by another observer by its continuous re-drawing in intension (or extension):

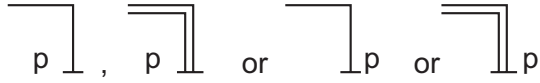
FIGURE [4]



This can be seen as a source of (Piaget's) object conservation.

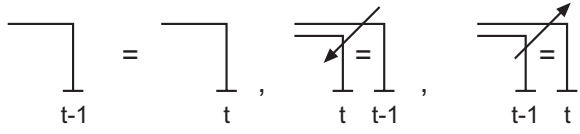
e) The external differentiation of mark and value,

FIGURE [5]



etc. is, in constant re-distinguishing, the source of time. Those distinctions which after a time appear indistinguishable one from the next (*i.e.*

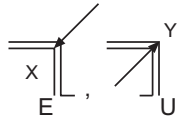
FIGURE [6]



are what Heinz von Foerster calls the eigen behaviours of eigen objects. See von Foerster 1976)

f) The apparent steadiness (in/out) in intension and extension resulting from the external observer leads to (unattainable) ideas of finality: the ultimate distinction of the elementary E (where, *e.g.*, quarks become rishons), the universal U. Since the value (to an other) is always inside (or outside) the ("final") mark, there is always another distinction: something "X" inside the smallest, "Y" outside the largest,

FIGURE [7]

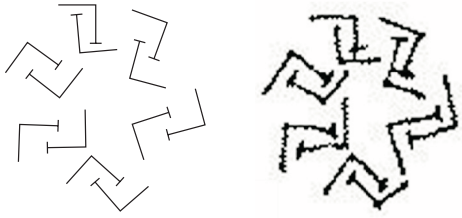


g) This is equivalent to saying that the distinction we claim to be final always assumes, at least at the moment we declare it final, one more (post final) distinction—that it is final.

h) Hence, distinctions being forms, at the unattainable final distinctions of intention and extension there is no formal difference, and thus there is re-entry.

i) The analogue may be given that a self-distinction its like a Möbius strip. But seen from an other's point of view it seems to be a circle. Then, at the points of the final distinctions, the other discovers the re-entry of the Möbius strip, also. There is, at that point, no inside or outside. ALL is continuous; itself. There, everything shimmers. Hence the way our paper (Glanville and Varela 1981) was written.

FIGURE [8]



A Möbius of "contained" distinctions!

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After we had finished this paper, I only saw Francisco once again: at the Gordon Research Conference on the "Fundamentals of Cybernetics" held in New Hampton, New Hampshire in the summer of 1984—although we did correspond occasionally. We sat on a raft in the middle of a lake, drinking beer and singing Captain Beefheart songs in the late, summer afternoon.

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Soeren Brier has asked me what is the significance of this joint paper, and where it takes up? Although my intention has been to report on a collaboration, I will risk a little speculation.

1) *Significance*:
I think the significance of the paper was that it showed that, if you pursue the sort of logic Spencer Brown suggested (at least to us), you end up with a recursion that leads to re-entry (precisely because Spencer Brown's laws are laws of form), and that looking for absolute limits leads to circles. It was also, I believe, interesting to introduce the notion of a Möbius strip as the metaphor for the form of distinction, in place of the circle.

2) *Where it takes us*:
I think our paper brings out the central importance of notions of inside and outside in cybernetics. Using a spatial metaphor, do boundaries distinguish an in- and outside, or only themselves? This relates to one aspect at the crux of the

debate about self-reference and second order cybernetics—what it allows us to say, bringing into contrasting view the circle and the Möbius strip forms as metaphors for different understandings, which gives rise to new understandings. In my case, I see this very spatially, in terms similar to those of Edwin Abbott in his (1884) "Flatland." You can either see the form of the distinction as a Möbius strip, which leaves us unable to speak of it (as an outsider), or as a circle, leaving us endlessly drawing distinctions—in intension and in extesion, never getting to that (presumed) self, but learning about endless observation. This is the view and the account of the other's view of that elusive (and presumed) self. So the paper is one of the initiators of the attempt to bridge the crucial and immensely difficult-to-handle difference between the knowing of the self, and the knowing of the other. Neither view is, I now believe, exclusively correct—we need both. As Francisco wrote about this time, "Not one, not two" (Varela 1976).
In other words, we distinguish the difference between in- and outside, self and other, and their views of these. Our paper, I believe, gives us hints of ways to recognise and work with these differences.

3) *The bringer of comfort*:
So, the importance of this work is that it helps us understand the world in which Spencer Brown's logic works. At the time Francisco and I worked on the paper, this world was still, for most, totally strange. Yet the declamations of the book such as "Draw a Distinction!" were compelling. It seemed necessary to explore the nature of the world of distinctions, and the form of this world. In our paper, I believe we pushed the envelope, and discovered this form. As it turned out, it bears a striking resemblance, in its re-entry, to the Möbius strip that I have claimed as the form for the distinction, and which Spencer Brown used on the cover of his later, limited edition (in 1994, and much to my delight). At the same time, others, especially Louis Kauffman in this journal, have explored the topology of distinction, of the conjoining of distinctions, and their meaning. All this could be said to rely not only on Spencer Brown's seminal work, but attempts such as in Francisco's and my joint paper to clarify the world that distinctions exist in. There is nothing much to develop from a paper such as this because its function is not as part of a developing argument, but to examine and set limits. As such, it is philosophical rather than mathematical: its function, if it has any, is to bring comfort and the feeling that we understand and know where we are, to provide legitimacy.
To tell us it's ok.

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I did not report this episode primarily because of Francisco's brilliance, or to bring to the reader's attention a paper I believe is important. Rather, I would like

to feel I have brought into view three points that help define and characterise Francisco for me.

Firstly, his generosity of spirit. In a very busy life, he made the time and maintained the enthusiasm to write this joint paper. This was, for him, common practice. A look at his publication list shows an exceptional amount of joint authoring.

Secondly, his delight in entering into the spirit of playful conversation, of batting ideas around till they eventually take on their own shape. This is a wonderful, synergetic way of working which we perhaps use too little.

Thirdly, his understanding of poetry, from which came his ability to deftly improve and tune what was written, and to exorcise what was inflationary and not entirely to the point (even in a foreign language).

I also wanted to communicate some of the pure delight we shared playing with our ideas together, watching them collide and grow. The joy and excitement of working at this level and in this way is something we rarely acknowledge—and that's a terrible pity.

Of course Francisco was brilliant, with an enormous skill as a theoretical and experimental scientist, his wonderful mind populated by an engaging curiosity and openness. But, I believe, he should be celebrated as a person for the qualities I mention above, even had he not made the important contributions he did as a scientist. These are the qualities that make us worthy humans, and they are qualities that go a long way towards creating elegant and precise work, helping us create beautiful understandings that make being human something really special. It is a pleasure to have come across Francisco's work. To have known him and worked with him is a greater pleasure.

Thank you Francisco.

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