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Fractals or Fish: Does a Space for Interdisciplinarity Exist?

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Abstract: Stanley Fish has argued that being interdisciplinary is impossible. He claims to base this on an epistemology of deconstruction. This paper examines Fish's case against living interdisciplinary. It shows that his arguments rest not on an epistemology of deconstruction but on a topologically simple, Euclidean view of space. Developments in the now science of chaos and fractal geometry are reviewed which supersede Fish's Euclidean view of space. These developments are shown to provide a discourse and a space for being interdisciplinary. An example of a fractal epistemology of deconstruction is reviewed that can accommodate being interdisciplinary.

STANLEY FISH, Distinguished Professor of English and Law at Duke University, and acknowledged Diego Maradona of the academy (Harphan, 1990), has questioned the possihility of being interdisciplinary. He goes considerably beyond the title of his article about being interdisciplinary to announce, "Being interdisciplinary is more than hard to do; *it is impossible to do*" (my emphasis, Fish, 1991). This paper will examine the basis of Fish's claim and then argue that he is captive of an inadequate discourse. It will show that Fish's analysis is not only situated in an epistemology of deconstruction but also in a Euclidean view and simple topology of space that has been superseded. Recent developments in complex dynamics and fractal geometry show the limitations of Fish's analysis and indicate that being interdisciplinary is not so hard to imagine or do.

Fish's Scholarly Situatedness, Goals and Practice

Fish locates himself firmly within the anti-foundationalist camp (Fish, 1989). In a published interview (Koelb and Lokke, 1987) he identifies himself with the post-structuralism of Derrida, Foucault and Barthes and the neopragmatism of Kuhn, Rorty and ethnomethodologists working in the sociology of knowledge. He says, "for me, post-structuralism and neo-pragmatism go together" (p.97). Fish's anti-foundationalism rests on his view of our radical human situatedness. Humans are inescapably situated and that situatedness is totally local and historical: "A situated self is a self whose every operation is a function of the conventional possibilities built into this or that context . . . anti-foundationalism reveals the subject to be always and already tethered by the local or community norms and standards that constitute it and enable its rational acts" (Fish, 1989, p, 346). For Fish there is no place aside from temporal and local context and no truth with a capital T, only the truth within situatedness. Further, humans are situated in local and temporal contexts *without remainder*. This is what Fish means by closure. In an Interview he speaks of those who "desire ... the old-fashioned fascistic concept of closure. I like fascistic concepts

myself. All my tendencies are totalitarian" (Koelb and Lokke, 1987, p. 92). Of course he is not speaking here in a political sense. He is speaking epistemologically. It is epistemological closure that he is talking about. In his view, no scholar can stand apart from an interpretative community and its discourse, and no interpretative community can stand "apart from history, rhetoric, the marketplace, the world of business, politics, interest, etc." ibid, p. 91). This situated closure is the basis of Fish's claim that being interdisciplinary is impossible to do. It is his view that the epistemology of deconstruction shows that "the interdisciplinary impulse finally does not liberate us from the narrow confines of academic ghettos to something more capacious; it merely redomiciles us in enclosures that do not advertise themselves as such" (Fish, 1991, p. 106). Thus, in Fish's view, "Either . . . the announcement of an interdisciplinary program inaugurates the effort of some discipline to annex the territory of another, or "interdisciplinary thought" is the name (whether acknowledged or not) of a new discipline, that is, of a branch of academic study that takes as its subject the history and constitution of disciplines" (ibid).

Fish's case is serious for those who claim to be interdisciplinary. It is serious first because Fish, as has been alluded to, is a substantial figure within the academy. But even more serious is the implication that interdisciplinarity is ruled out by the epistemology of deconstruction, the European import with much influence in the academy. Fish can legitimately claim to be a foremost American spokesperson for deconstruction. He has been one of deconstruction's clearest, most vocal and most prolific advocates to an American audience, with two books on the topic, numerous articles and in his prominent and contentious position as Chair of the Department of English at Duke University.[1] We see Fish most insistently as the self appointed expositor, interpreter, and defender of anti-foundationalism and an epistemology of deconstruction in *Doing What Comes Naturally* (Fish, 1989).

This paper will address the issue of whether the epistemology of deconstruction rules out being interdisciplinary. It would seem so if Fish does speak representatively for this position. We argue that this is not the ease. We will show that Fish's practice is multiply situated. It is indeed situated within anti-foundationalism and deconstruction, but it is also crucially situated in a topologically simple, Euclidean view of space which has been superseded. It is this latter situatedness and not the situatedness of deconstruction that leads Fish to claim that it is impossible to be interdisciplinary. Within the view of space provided by the new science of chaos and fractal geometry, a place tor being interdisciplinary exists. This paper first examines examples of Fish's practice to reveal that it "incorporates enclosures that do not advertise themselves," namely an outmoded, topologically simple, Euclidean view of space. We show that it is this rather than an epistemology of deconstruction that leads Fish to rule out heing interdisciplinary. We then introduce the new science of chaos and fractal geometry, which establishes a topologically complex view of space that allows for a betweenness, a space for interdisciplinarity, which is excluded by Fish's Euclidean situatedness. We conclude with evidence that a fractal epistemology of deconstruction does exist and that Fish is aware of it.

We take an example of Fish's analysis from *Doing What Comes Naturally* to illustrate the importance of spatial terms and assumptions in his discourse. In one of the chapters Fish is critiquing the views of Roberto Unger, a political philosopher who has attempted to establish a loosening or space from radical situatedness. Unger points toward a between space, situated, yet at the same time, loosened or partially distanced. Fish invokes his either/or argument, either total closure in situatedness or a return to foundationalism (which Fish cannot accept). For him there can be no between place, no iota of distancing in situatedness. Unger suggests that a loosening of situatedness can be achieved through a system of destabilization rights: "It is the right perpetually to unsettle and be unsettled, and were the condition of being unsettled to become more and more constitutive of the self, the contexts of its activities would be correspondingly *unsettled* [my emphasis], characterized by an openness to revision so total that revisibility

would be their essence" (Fish, 1989, 427). This perspective shows a similarity to the notion of fractals which we will explore later. But, Fish will have none of it: "But of course all of this is a contradiction in terms. Contexts and selves in perpetual movement can have no stability of form, and while that is precisely the state of being (or non being) that Unger desires, it does not correspond to anything that is possible for a finite creature, for a creature defined by his situatedness" (ibid, 423). This is true only within a Euclidean and topologically simple space. Fractal space has precisely this character.

Unger proposes a "negative capability." "Negative capability is defined as the practical and spiritual, individual and collective empowerment made possible by the *disentrenchment of formative structures*" (my emphasis, ibid, 428). As we will see below, this is analogous to arguments made for interdisciplinarity by Robbins. Fish responds, "if negative capability is the empowerment made possible by the disentrenchment of formative structure, then it is not an empowerment of the kind that Unger requires because *the disentrenchment of one formative structure is always simultaneous with the establishment of another.* Whatever 'power' the agent acquires he acquires by courtesy of the new structure, and therefore it cannot be power by which he is emancipated (even partially) from the sway of structure altogether" (my emphasis, ibid, 429). Once again the completeness of Fish's closure is demonstrated. Fish comments further on Unger's attempt to create an emancipated agent from total situational closure by agendas he calls "deviationist doctrine," "internal development," "institutional reconstruction," "expanded doctrine," and "destabilization rights." 'if you are a finite being, and therefore situated, you are wholly situated, and no part of you or your experience is asituational; your every capability is positive, a reflection and extension of the system of belief that bespeaks you and your possibilities, and there is nothing negative (detached, independent, free) to nature" (ihid, 430). This is the very same argument that Fish makes against the possibility of being interdisciplinary. We argue that Unger's discourse is pressing toward a notion of fractal space while Fish's discourse rigidly denies anything but complete closure. We will demonstrate (in Fish's sense of the word) that he is captive of a limited discourse. Such spaces as Unger and interdisciplinarity point to do exist. Here is Fish's summary of Unger's "failed" efforts:

> Despite all his efforts Unger is unable to provide a traversable middle ground, a *space* in which transcendence has not yet arrived but constraints have in part relaxed, a *space* that offers the opportunity of transforming (rather than merely extending) work, a *space of politics* (his emphasis), not of politics as 'a disconnected series of trophies with which different factions mark their victories,' but of a politics that 'promises to liberate societies from their blind lurching between protracted stagnation and rare and risky revolution,' a politics whose end will make what we know as politics unnecessary" (my emphasis, ibid, 430).

This is an important passage for two reasons. First, it is a clear example of Fish resorting to spatial terms in his discourse. He de facto thereby admits that what is at stake are the types of space that can and can not exist. Secondly, Fish has himself described a fractal space which he then denies can exist. We will show that indeed such fractal space docs exist.

A further example of how the closedness of Fish's Euclidean space operates to prohibit tbe possibility of being interdisciplinary can be seen in his response to Robbins' suggestion that "while exercising our profession, we simultaneously occupy overlapping and simultaneously conflicting institutions" (Robbins, 1985, p. 3). Would this not open up an interdisciplinary space? Fish's answer is a definite No! "The imported product will always have the form of its appropriation rather than the form it exhibits 'at home'; therefore at the very moment of its

introduction, it will be marked by the discourse it supposedly 'opens'. When something is brought into practice, it is brought in in terms the practice recognizes; the practice cannot 'say' the Other but can only say itself, even when it is in the act of modifying itself by incorporating material hitherto alien to it" (Fish, 1991, 107). This is true *only* if one holds to the either/or rigidities of Fish's space. Boundary regions exist in fractal space created by the equal "pull" of attractors. These between places give rise to beautiful, infinitely patterned complexity that never resolves to either/or. They are both/and and correspond to being interdisciplinary. Let us now turn to a practice and discourse that displays the very aspects that Fish pronounces impossible, the new science of chaos and fractal geometry.

Fractals and Chaos

James Gleick, in his book *Chaos* (1987), telis the story of the making of a new science from an internal perspective. Hayles, in *Chaos Bound* (1990), gives an account of the development of the new science within the larger cultural matrix. Some say the twentieth-century science will be remembered for just three things: relativity, quantum mechanics and chaos (Gleick, 1987, p. 6). That places the new science of chaos in some very prestigious company, indeed! Although the new science traces its roots back to Henri Poincare, who was born in 1854, the field really only emerged as a self-conscious entity in the 1970s. The first contemporary paper is generally attributed to Edward Lorenz and was published in 1963, but it initially had almost no impact (31). A reasonable marker for the origin of the field would be the first conference held on chaos. This took place in the summer of 1977. Approximately one hundred people came (ibid, 184). Gleick says of the new science, "Chaos has become not just theory but also method, not just canon of beliefs but also a way of doing science" (38).

Benoit Mandelbrot is an IBM Research Fellow also with a position at Yale University. "Between the late 1950s and early 1970 he evolved a new type of mathematics, capable of describing and analyzing the structured irregularity of the natural work, and coined a name for the new geometric forms involved: *fractals*" (Stewart, 1989, p. 216). I shall argue that fractals describe the between space that Fish's situated closure rules out. Mandelbrot's magnum opus is *The Fractal Geometry of Nature* (1911). Fractals and chaos have been shown to he related. Both grapple with the structure of irregularity and betweenness. "But in chaos, the geometry is subservient to the dynamics, whereas in fractals the geometry dominates. Fractals present us with a new language in which to describe the *shape* of chaos" (my emphasis, Stewart, 216). Fractals present a discourse of dynamical systems in spatial terms and is therefore directly comparable to Fish's resort to a spatial terminology to present his situated closure. We present demonstrations from the science of chaos and fractals which contradict Fish's situated closure.

Dispersion in Situatedness

The first demonstration is an example from the new science of chaos. Using terms of Fish's discourse it illustrates the existence of dispersion and indeterminacy[2] *in* situatedness, a possibility he denies. A mathematical equation like

$$y = kx(l-x)$$

yields about as rigid situatedness as one can imagine. Put in a value of x and out comes a value of y. Let's see how this works specifically. For simplicity let k = 1 and try various values of x. You can confirm for yourself the values in the table below.

$Y = X(1-X)$

Nothing surprising here. Situatedness or determinism seems solidly in place.

X	Y
0	0
1	0
-1	-2
2	-2
-2	-6

We have approached the equation in typical Cartesian fashion. We now approach the equation by the practice of the new science of chaos. This approach is called iteration: "When a number goes into the equation, a new number comes out; the new number goes in, and so on, points hopping from place to place. A point is plotted not when it satisfies the equation but when it produces a certain kind of behavior. One behavior might be a steady state. Another might be a convergence to a periodic repetition of states. Another might be an out-of-control race to infinity" (Gleick, 227). We approach our original equation by iteration. Again we choose k=1.

$Xn+1 = Xn(1-Xn)$

Xn	Xn+1
0.6	0.24
0.24	0.1824
0.1824	0.1491
0.1491	0.1268
____	____
____	0

Notice that both Xn and Xn + 1 are getting smaller. If we continued the process we would find the values approach zero. The chaos scientist would say the zero is an attractor. However, nothing unusual has appeared yet. No evidence of dispersion has appeared. Conventional ideas of situated closure are still in place.

Now let's try it again with k = 4 and starting with X = 0.1.

$Xn-1 = 4\ Xn\ (1-Xn)$

Xn	Xn+1
0.1	0.3600
0.3600	0.9216
0.9216	0.2890
0.2890	0.8219
0.8219	0.5854
0.5854	0.9708

Now this is something new! The points jump around without any apparent order. If we continue the process of iteration we find that the numbers never settle down. The output of numhers generated by this iteration satisfy any test of randomness. We have an example described in the discourse of chaos science as "stochastic behavior occurring in a deterministic system" (Stewart, 17). If we transpose this into the terms of deconstruction then we have a serious case of dispersion or leakage arising in a very rigid situatedness. Scientific discourse before the 1970's sounded very much like Fish's discourse. Stochastic or random behavior and deterministic systems were thought to be totally antithetical: "To even entertain the question, can a simple deterministic system behave like a random one, ran counter to almost everybody's intuition even to ask it" (ibid, 55). That is now no longer the case. It is worth stressing that a mathematical equation represents an extreme case of situatedness. It certainly seems at least as rigidly situated as say a scholar in an interpretative community. But some might say, "this is a mathematical equation. What bearing does this have on scholarly practice and interdisciplinarity?" In answer, let me point out that the equation we have been examining, called the logistic equation, has been applied to the population dynamics of species like the

gypsy moth. The science of chaos or non-linear dynamics has now heen successfully applied to systems as varied as fluid flow, the rhythms of the human heart, certain epidemics like measles and chickenpox, the behavior of the stock market, and the arms race that led to the first world war (Gleick). Behavior like that illustrated by the logistic equation has been found for all these systems. As Gleick says, "chaos breaks across the lines that separate scientific disciplines. Because, it is a science of the global nature of systems, it has brought together thinkers from fields that had been widely separated" (ibid, 5). It is perhaps more accurate to drop the term *scientific* and say that chaos breaks across the lines that separate disciplines. Finally, it is worth emphasizing that the realm of scholarly practice or scholarly discourse is *a dynamical system*. The new science of chaos therefore has every right to apply its practice to this system. When it does, its discourse does not resemble Fish's with its situated closure, its outmoded topologically simple and Euclidean space.

The Between Space of Fractals

We have pointed out at several points that Fish's discourse utilizes spatial terms at times. Situatedness implies a site, a location in space. Closure is a term that has topological significance. To illustrate this we recall Fish's critique of Unger. He criticizes him as being "unable to provide a *traversable middle ground* a *space* in which transcendence has not yet arrived but constraints have in part relaxed, a *space* that offers the opportunity of transforming (rather than merely extending) work" (my emphasis, Fish, 1989, 430). This discourse transposes the issues to a more abstract level about the nature of space. Fish's space is Euclidean; it is of integral dimension and closure is its topological character. At this level of abstraction Fish's argument against Unger is that he describes an impossible space, a space that does not exist. We will now demonstrate that such spaces do exist.

Until Mandelbrot and chaos science, many scientists accepted a view of space like that of Fish. It is a view of space that traces its origins back to Descartes. Scientists have a way of transposing dynamical systems into geometrical form. The basis of this is phase space.[3] Before Mandelbrot, scientists believed they could fully capture natural phenomena in a space of Cartesian coordinates and dynamical systems in phase space by forms with closure.[4] Now all that is changed. Many natural phenomena have been found that demonstrate fractional dimensions. This includes the length of the coast line of say Britain, clouds, bronchial tubes and the artery and vein systems, to name a few. "At first, this idea may seem bizarre. How can it make sense to say that something has one and a quarter dimensions'? But the snowflake is obviously more crinkly—better at filling up space than a smooth curve which has dimension one. And it is less good at filling up space than a surface of dimension two. A dimension somewhere between 1 and 2 makes good sense" (Stewart, 219).

Many dynamical systems have been found that lack closure in phase space. An example is the Lorenz attractor (Gleick, 28). All of this suggests that Fish's spatial and topological discourse is seriously out of date. I will conclude with a view of fractal space that emphasizes its lack of closure, its radical betweenness and the endless beauty that results from the subtle interplay of situatedness and dispersion in that between space. Consider the logistic equation we considered earlier: Xn + 1 = kXn (1 - Xn). Notice that it is made up of two parts, kXn and (1 -Xn). For k larger than one, kXn under iteration increases or stretches. On the other hand as Xn increases, (1-Xn) decreases.

Xn+1 = kXn for k = 2, and Xn = 0.1

kXn	kXn+1	Xn	(1-Xn)
0.2	0.4	0.1	0.9
0.4	0.8	0.2	0.8
0.8	1.6	0.3	0.7
1.6	3.2	---	---
		0.9	0.1

The effect of this is that when kXn and (1-Xn) are multiplied the outcome is folded back into the original interval 0 to 1.

For certain values of k, this interplay of stretch and fold leaves the resultant iterations to dance in a complex and never ending between-space. We see this complex dance in Figure 1, which is a plot of the logistic equation for values of k out to four. In Figure 1 at the far left, the iterated values converge to a single value. Proceeding to the right, a bifurcation point occurs and the iterations converge to two alternating values. Moving to the right additional bifurcations occur yielding as the output of the equation first four values, then eight, and so on. The dark areas are masses of points that indicate that the output of the equation never settles down. It jumps stochastically-like to points between 0 and 1. Still further toward k = 4, the iterated equation's results converge to fixed values (order out of chaos), then bifurcate rapidly to stochastic-like black areas of dense points again.

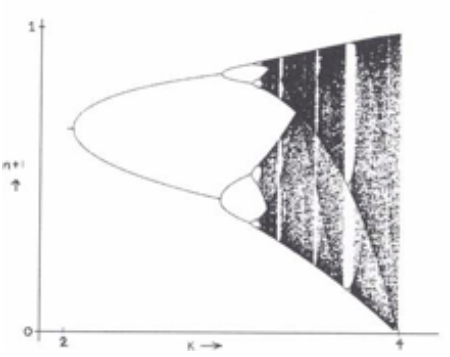

FIGURE 1. Plot of the logistic equation. (Shown on page 110 of article)

The most dramatic and beautiful example of this dance of between-space, a space that can be viewed as created by and between competing situatedness, is the Mandelbrot set. This arises from the iterative mapping of the simple function Zn + 1 = Zn2 + c in the complex plane. How different points in the complex plane behave is indicated by color. One area of color represents one type of behavior, a second color another, etc. The interesting space is the between-space, those regions on the boundary of two behaviors. These boundary regions, these between-spaces, show subtle and beautiful patterns. As we magnify these boundary regions, intricate new patterns appear, similar to what we saw before but somehow different. The endless patterns, self-similar but not identical, are a result of constraint *and* freedom. This is a dance without bottom. As we magnify to greater and greater magnitudes, the patterns continue. The best way to get a feel for this between-space is to see it and hear it.[5] As you do, think of Fish's description of Unger's "impossible" space—"a traversable middle ground, a space in which transcendence has not yet arrived but constraints have in part been relaxed, a space that offers the opportunity of transforming (rather than merely extending) work" and Robbins suggesting that "we simultaneously occupy overlapping and conflicting institutions" (3). Yes, such spaces do exist; they can be seen and heard. Why are they so fascinating and compelling? Perhaps it is because they are metaphors of our own consciousness. These spaces can be the basis of a

scholarly practice, a practice that arises *inter*disciplinarily, a space between the situatedness of disciplines, escaping their closure. It is a space which owes its existence to the situatedness of two or more disciplines but produces something more than either. It is a space of endless creativity. Stanley Fish's situated closure is too confining for the real world and the world of scholarly practice and discourse. There is indeed a space of interdisciplinary scholarship. Interdisciplinary is not so very hard to imagine or to do.

A Fractal Epistemology of Deconstruction

We conclude with evidence that a fractal epistemology of deconstruction does exist and that Fish is aware of it. In a 1987 interview with Fish we find the following exchange. Fish has just talked about his idea of radical siluatedness, and one of the interviewers. Lokke, asks:

> Lokke: ... And the opposite goal (to closure), of total dispersion, of—
> Fish: Yes, total dispersion is the dream of one branch of post-structuralism. Some of de Man's followers *court* dispersion.
> Lokke: I'm not sure that makes any sense.
> Fish: They want to escape assertion. They hate totalization, hate closure. So they keep trying to make texts leak. They want slippage, and leakage, and sometimes shrinkage.
> Leland: Indeterminacy?
> Fish: They want indeterminacy, and I'm here to say that there's no such thing as indeterminacy. There's no such thing as indeterminacy in the sense of that wonderful polysemous vision that Roland Barthes calls up in the first ten pages or so of S/Z, where he said; "What we want is a plural text which you can enter from any place" and so forth and so on, where there's no beginning and no end and no middle. All of which is an old theological concept.
> Leland: And it's also a dream of total liberation from any kind of conceptual . . .
> Fish: Absolutely. So that dream—the desire for dispersion—is the desire for escape from the old-fashioned fascistic concept of closure. I like fascistic concepts myself. All my tendencies are totalitarian (Koelb and Lokke, 1987, pp.91-92).

We have already surveyed a realm of practice and discourse where dispersion, and slippage, leakage and, yes, indeterminacy reign. It is not a realm of old theology; it is a realm of the new science of chaos, a realm of fractals and strange attractors and stochastic behavior resulting from deterministic processes. Those whom Fish refers to as "some of de Man's followers" would seem to represent a fractal epistemology of deconstruction. That is, they would be situated in an epistemology of deconstruction with a view of space that is fractal and topologically complex.

It seems clear that Fish's judgment against the possibility of being interdisciplinary emerges not from an epistemology of deconstruction but rather from his situatedness in "an enclosure that does not advertise itself," a topologically restricted Euclidean space. A fractally situated epistemology of deconstruction exists and with this interdisciplinary is not so hard to imagine or to be.

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End Notes

1. See Richard Turner's "Introduction" to the reprint of "Being Interdisciplinary is So Very Hard to Do" in *Issues in Integrative Studies, No. 9*, pp. 97-98. (1991).
2. Indeterminacy does not translate as nicely as dispersion between the two discourses. However, 1 believe that inherent in Fish's use of indeterminacy are notions of randomness or stochastic behavior, which are terms in chaos discourse.
3. For a lay-person account of phase space see F. David Peat. *The Philosophers Stone* (New York: Bantam, 1991, pp. 25-33).
4. Actually Poincare had caught sight of forms in phase space without closure.
5. The visual beauty of fractals can be seen in *The Beauty of Fractals* by H.O. Peitgenatid P.H. Richter (New York: Springer-Vcrlag, 1986). A video of fractal zooms has been marketed by Art Matrix titled "Mandelbrot and Julia Sets" (Ithaca, N.Y.: Art Matrix, 1990). The musical album "Botanica" (Los Angeles, Ca.: Deep Music, 1989) transcribes fractal spaces into sound.