

Enframing: The view from within

Bernard Ricca

Saint John Fisher College (USA)

Since at least the time of Galileo, physicists have considered *frames of reference*, how to communicate between those frames, and how different frames may be more or less useful in a particular problem. Among other things, these frames help to define a relationship between a researcher and the system being studied and influence how the boundaries of the system are determined. As an example of the usefulness of considering frames of reference carefully, Einstein's general and special theories of relativity are ultimately about how things appear to observers in different frames.

This use of frames, however, has several important, and usually unexamined, consequences. First, the observer's frame, in classical physics, always leaves her outside the system under consideration: the observer is not examined, whereas the system is exactly that which is examined.¹ Second, the choice of frames helps to define *a priori* the important observables for a system under consideration, and it is assumed that the choice of variables is done "objectively" (i.e., all researchers will choose the same variables and measure them with identical results). Lastly, as the lens of a camera limits what the photographer sees, the (classical) choice of frame largely cuts the system off

¹ It is true that both quantum mechanics and relativity begin to examine the observer. However, quantum mechanics and relativity mark the transition from classical physics to "modern physics". Despite the terminology, classical physics has all the hallmarks of philosophical "modernity" and "modern physics" really belongs more to the post-modern worldview.

from the world and from the researcher. By doing all this, the researcher can be, and usually is, treated as a passive recorder of information coming from the system.

As we shall see, each of these consequences is problematic when examined more closely, and particularly when looking at complex systems. However, for systems that are linear and closed (or nearly so²), this modernist stance has proven to be very useful. The classical study of linear systems can be fruitful even with *a priori* choices regarding observables as the system exhibits no “surprising” behavior (nonlinearities are required for a system to produce novel behavior). Further, closed systems “really” are isolated from their environments, and so framing closed systems classically does not affect their study. From a pragmatic point of view, we can examine the results of classical science, and see that much of our technological world, such as the computer upon which I am composing this, works just fine.

To state this point differently: From a classical perspective, and for the study of classical (linear and closed) systems, classical framing works well. However, once we move beyond a classical perspective, or move beyond the study of classical systems, we will see that this type of framing does not work, either in theory or in practice. A new way of dealing with frames, *enframing*, must be used. *Enframing* is an attempt to examine the unexamined assumptions of classical framing, particularly as they relate to the researcher, and to treat the subject of the research, the researcher, and the process of the research simultaneously and within the same framework. This attempt has also been referred to (in a slightly different context) as *endo-physics*³ (Rossler, 1985). Kampis (1991, 1994) demonstrates that the proper way to model biological and physical complex systems, especially those with emergent properties, is from an *endo-* point of view. Let us look more closely at the necessity of *enframing* and the implications it carries for social science – including educational – research.

Although modernist science has been quite successful in its goals – again, think of my computer – post-modernist thinking has called into question some of the assumptions of modernist science. In particular, post-modernism has introduced a necessary reflexivity and the repudiation of classical objectivity: researchers have perspectives relative to the researched and those perspectives make a meaningful difference when it comes to research methodology. Post-modernism however – at least in its relativist manifestation – largely has retained the idea that the researcher is outside of the researched.⁴ We will examine these three notions more closely below. All of these changes can be seen to be part of a process of *enframing*.

² A strictly closed system would be completely disconnected from the rest of the world. This would preclude any ability for the system to transmit information to the researcher. Hence, the study of “closed” systems is really the study of “nearly closed” systems. The mathematics by which these nearly closed systems are studied normally uses “boundary conditions” to deal with the slight opening of the system, and such techniques have proven themselves fruitful for these classical systems.

³ From *endo* meaning “inside” and *physis* meaning “nature”. The observer/researcher is, at least partially, inside nature.

⁴ I’m indebted to one of the editors for pointing this out.

The attempt to apply reflexivity and perspective to modernist science is examining a system that is a different system than the system examined by modernist science. I believe that, in a very real sense, the system post-modernity would (or should?) examine is the new system comprised of {the researcher researching {the classical system}}⁵ and not merely {the classical system} or {the researcher researching}⁶. Post-modernity moves beyond modernity partially by attempting to treat the researcher, and not just the researched, as a system to be studied. However, and this should be carefully considered, post-modernity really does not treat {classical systems} by themselves.

Let us follow this further. Modernist science is good at studying {linear, closed systems}. Postmodernism applied to modernist science examines a different system, {the researcher researching {the classical system}}. Clearly, a researcher is a complex system, although the classical system is not. The distinction between simple and complex systems is important here. For the case of {a linear system embedding {a linear system}}, reductionism has proven itself to be useful (speaking from a pragmatic point of view) and is likely to be appropriate. Certainly, however, {a complex system embedding {a linear system}}, such as our {researcher researching {a classical system}}, is not amenable to reduction. In this case, it likely is appropriate to study the {researcher researching} using a different framework than is used to study the {classical system}. Recall that the {classical system} is closed; that fact allows this separation to be made. However, in the complexity sciences, the case to be considered is {a researcher researching {a complex system}}; both components are complex. Let us use *enframing* to examine this situation, and some resulting paradoxes, more carefully.

Reflexivity implies that the researcher herself is a system that is important to examine. Reflexivity examines the {researcher researching {a complex system}}. To avoid having a researcher “be” in two places simultaneously – inside and outside the frame of the {researcher examining {the researcher}} – we usually use different frames to examine the {researcher} and {the complex system}. From our perspective as a researcher, we examine {the complex system}. Paradoxically, however, we “step outside ourselves” to look at ourselves. Hence, we have two separate examinations, with two separate frames: the {researcher examining {researcher}} and the {researcher researching {a complex system}}. In this case, we do not have the {researcher examining {researcher researching {the complex system}}}

The notion that our perspective leaves us in a position outside the researched may be true in some cases. However, even leaving aside the problem of perspective and reflexivity noted above, there are certainly cases of at least partial overlap between the researcher and researched: they may share language, culture, etc. In this case, should the researched be framed to exclude the researcher, implicitly claiming that anything shared by the researcher and researched is unimportant, or do we frame the researched to

⁵ In an attempt to provide some clarity when identifying systems, I will use braces.

⁶ In practice, it appears to me that many postmodern studies do simply study {the researcher} or {the researcher researching}. If this is true, then it would be problematic, but a consideration of this question is beyond the scope of this work.

include the researcher (at least partially), asking the researcher to stand in two places – both inside and outside the frame – simultaneously?

While other issues can also arise, the usual resolution to problems such as these generally is to use different frames and to do so at different times. This resolution, however, raises other issues.⁷ Because the frames are different, there may be a privileging of one frame over the other. Further, because there may be some necessary overlap between the {researcher} and the {researched} the use of different frames is somewhat inconsistent.

Taken together, these problems indicate that the researcher of a complex system must be inside and outside the researched – and the self, for that matter – simultaneously. Even in the presentation here, there is a great deal of entanglement and overlap between points; the presentation is not – and cannot be – strictly linear, as we would usually expect of a written piece. Because of the need to be both inside and outside, complex research needs a sort of *Klein bottle*⁸ approach to epistemology and ontology. We need to deal with the researched and the process of research within the same conceptual framework, from inside that which is studied, using what Kamps calls an “explicit epistemology” (1994, p. 98). Like the *Klein bottle*, this is impossible.

There are, however, ways to approach the creation of this *Klein bottle* research, and we have seen hints of one way above: braces inside braces. One way is to take a recursive⁹ approach to research: research the research that researches the research that.... In such a recursive process, each step produces a refinement of the research by always using the same process, but there may be no “end result”. In doing this, we see research itself as a complex system, rather than merely as a set of procedures. While this would produce an approach toward coherence, it would also involve a tentative-ness in that recognizes the situation (and the current understandings) may change at the next stage, and that research (and not merely the “results” of the research) may adapt to these changes. Another enticing idea is to make use of hyper-linked texts, as these do not need to be followed linearly, and hence can take on a topology closer to that of a *Klein bottle*.

Several important results are likely to follow from a close consideration of enframing. Kamps (1991) considers how the nature of time is different when seen from the *endo*- or *exo*-view; he also uses *enframing* to consider a refinement of autopoiesis that escapes some of the problems associated with that idea. Further, emergent properties of a system are likely to be more cleanly dealt with by a careful *enframing* of the situation. In addition, one can speculate that how *enframing* researchers may understand the nature of time in a manner that better aligns with Whitehead’s notion of process. Lastly, I suspect that what some might call the unreasonable effectiveness of phenomenology

⁷ In its favor, this abandonment of simultaneity and single perspective perhaps does help us retain our sanity and achieve tenure.

⁸ A *Klein bottle* is a topologically impossible figure. Created by attaching the edges of two Möbius strips together, the bottle’s inside is the same as its outside.

⁹ Here, it is important that *recursive* not be confused with *iterative*. An *iterative* process is a process that, given an initial input, operates repeatedly on its own output. A *recursive* process is a process that operates repeatedly *on itself*, so that the process is both the process and the object of the process.

may be partially due to its recursive approach. These and perhaps other notions may become more tractable from a careful *enframing* of situations.

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About the Author

Bernard Ricca is an Assistant Professor of Mathematics at Saint John Fisher College. Formally trained as a physicist, he has worked as a teacher educator for most of the past 15 years, and is the current Chair of the Chaos and Complexity Theories Special Interest Group of AERA. When not working at his day job, he can often be found cycling or eating.

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