



# Industrial Ecology's Babel Tower: Multidisciplinarity, a Strength or a Weakness? Give Analogy Up as Lost

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## Give Analogy Up as Lost

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Industrial ecology, as a field, has to take up the challenge of reconciling unity and diversity. On the one hand, different approaches of industrial ecology share the belief that the analogy with natural ecosystems is able to improve our use of natural resources. On the other hand, industrial ecology is scattered throughout many scientific disciplines that are only loosely connected with each others. How can unity and diversity be reconciled?

Our philosophical and epistemological approach proposes to link diversity (which appears with the different approaches of industrial ecology) by reconsidering the understanding of unity (which can be found in the analogy). By questioning the underlying implications of the analogy with natural ecosystems, we open a path toward industrial ecology as a real interdisciplinary field.

### “We ought to act as an ecological community”

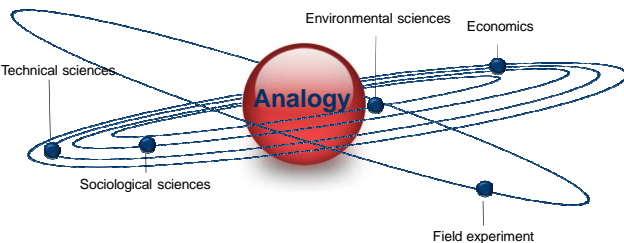
The dazzling myth of industrial ecology's analogy: an obligation of means which contributes to the scattering of the field

The analogy with natural ecosystems, which remains the core of industrial ecology, structures the field around an obligation of means: *we ought to act as an ecological community*. The different disciplines, which compose the industrial ecology system, appropriate this obligation of means by developing a range of methodological, analytical, and operational tools. These may lead to innovative forms of cooperation for sociological sciences or looping of flows for technical sciences.

As an obligation of means, the analogy contributes to the scattering of the field. The unity embodied in the analogy is disseminated in each discipline which focuses on one of its aspects. Each discipline then revolves around the analogy following its proper orbit, and never crosses other disciplines' courses.

Industrial ecology then appears as a standardized and partitioned field. Multidisciplinarity is artificially pieced together by the juxtaposition of theories and methodologies developed by each discipline.

It is revealing that controversies cast doubts on the theoretical and operational merits of such an analogy: is it a good scientific analogy (Hess, 2010)? Is the notion of industrial symbiosis real or is it an intellectual tool to think and organize phenomena (Gentner, 1982)? Is it always a good idea to create an industrial symbiosis (Johansson, 2002)? These ontological and operational pressures on industrial ecology contribute to blur its scientific legitimacy and thus to slow down its structuring as a field.



Analogy, as a model, is indeed criticized for its lack of scientific basis, whereas analogy, as a metaphor, is decried for its ideological tendency. In order to overcome this dilemma, we must transfer the focus from the numerous interpretations and criticisms of the analogy, to the understanding of this dilemma's origin (Hacking, 2001), which is the concept of analogy itself understood as an obligation of means.

A solution then appears: it consists in converting this obligation of means into an obligation of results. If we do not have to behave as an ecological community, is it not because *we actually are an ecological community*? This means that industrial ecosystems do not only resemble natural ecosystems. They are bound by the same physical and biological rules that dictate the behavior of natural ecosystems.

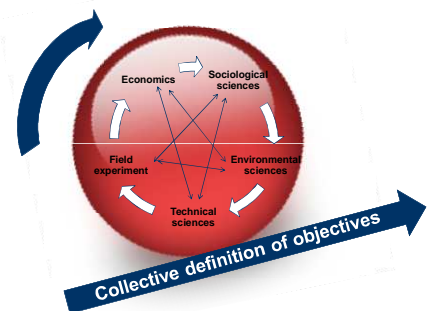
This postulate is a real revolution for the field of industrial ecology, from a multidisciplinary partition to an interdisciplinary “active subsidiarity” (Calame, 1996). It imposes the necessity of a collective and permanent definition of the theoretical and operational objectives for industrial ecology – these very objectives that we had lost sight of because we were obsessed by the analogy and believed that the only objective of industrial ecology was to close loops. Industrial ecology then could appear as an interdisciplinary learning network. Diversity of industrial ecology's approaches could then be articulated and unity be found in a common direction taken by this learning network.

### “We are not only an ecological community”

The clarification of industrial ecology's objectives: an iterative and permanent learning network which contributes to the multidisciplinary structuring of industrial ecology

### “We are an ecological community”

The evidence of industrial ecology's postulate: an obligation of results which is the condition of success of industrial ecology as an interdisciplinary field



But, if we are an ecological community, we are compelled to act as an ecological community: we have no choice but to follow the same physical and biological rules. The evolution of industrial ecosystems is thus bound to the same natural laws. It appears illusory to want or decide to implement industrial symbiosis in order to optimize resource management by closing loops. If we are an ecological community, industrial ecology can not be vowed. Such a conclusion could announce the end of industrial ecology as a theoretical and operational field. Is such a biological determinism bearable?

Industrial ecology, as it is traditionally understood, focuses on the ability of natural ecosystems to close feedback loops. It forgets to consider another fundamental characteristic which is the ability of deviance: it happens that ecosystems do not always behave as we would expect. If industrial ecosystems are ecological communities, they must draw on this ability to bring out emergent “strictly human” abilities. The identification and understanding of such emergent “strictly human” abilities must become our shared road map in order to build a collective definition of obligations of results, which will contribute to the multidisciplinary structuring of industrial ecology.