**Letter to the Editor**

Bohne, R. A. 2003. **Why We Need a Better Understanding of Ecology and Environmental Dynamics in Industrial Ecology**. Letter to the editor regarding J. Spiegelman's (Winter 2003) "Beyond the Food Web: Connections to a Deeper Industrial Ecology," *Journal of Industrial Ecology* 7(1): 17–23; and J. Ehrenfeld's (Winter 2003) "Putting a Spotlight on Metaphors and Analogies in Industrial Ecology," *Journal of Industrial Ecology* 7(1): 1–4.

I welcome both Jonah Spiegelman's proposal to move beyond the biological analogy to a more literal connection between industry and the environment through the use of non-equilibrium thermodynamics ("Beyond the Food Web: Connections to a Deeper Industrial Ecology ) and John Ehrenfeld's careful parsing of the differences between analogies and metaphors in this issue of the Journal of Industrial Ecology. However, I worry that the industry ecology community is forgetting an even more basic relationship between industry and ecology: the use of conventional ecological science to assess human impacts on the environment.

After reading industrial ecology literature for more than four years now, I keep coming back to the questions "so what?" and "where is the ecology?" And though the metaphor is promising, what I have seen so far can at best be described as "industrial physiology", but more often it is closer to "industrial taxonomy" or "industrial metabolism". Does this matter? I believe it does. For without a more holistic ecological view on how can we change towards sustainability? It doesn't matter how many accurate MFA, SFA or policy analyses we have, if we don't know what this means for the environment. How can we perform impact analyzes if we don't know the impact? What are the short and long term effects of anthropogenic run offs?

If industrial ecology is to have any meaning, it is my view that we must be able to know what is sustainable and what is not. We have to move beyond analogies and metaphors. An MFA or SFA is only useful if the consequence of this resource extraction and/or "pollution" can be told, especially the long term effects. We have lots of examples from history and natural science to draw upon. After having established the nature of the impact, we can introduce the appropriate policy in order to change society towards sustainability. Only then can we avoid the repetition of the past, and start reconsidering the economic and industrial models as Spiegelman's points out.

In order to counterbalance the current development I feel it necessary for the IE community to respond in at least two ways. First we must be able to attract and include scientific ecologists into IE, then and only then can IE achieve a holistic view on anthropogenic influence on biological stocks and on our contribution to the biogeochemical cycles and our impact on these. Second, practitioners of industrial ecology must educate themselves, such that they at least have a basic understanding of some ecological basics. It would be a good start if at least the following concepts would make a common foundation, i.e. a common minimum knowledge space, within the industrial ecology framework;

• Limits to growth
• Biological loops
• Population dynamics, delays and regulation
• Chemical buffer capacity
• Evolution
• Nutrient limitation, eutrophication

If we can assume that the recently published Handbook of Industrial Ecology reflects the common knowledge base within industrial ecology, these issues are either omitted or only superficially touched.

In this letter I have chosen to look upon the long time effects of development, maybe in a different manner, than the current discussions within industrial ecology goes. And the conclusion is quite clear: Real environmental understanding must be given a larger place within industrial ecology, also among non-biologists. For industrial ecology to flourish, we must be able to visualize how industry and society influences on the environment, both at a short and long term time span.

We do possess great knowledge, thus it is of vital importance that we do not forget the course of history, but make use of earlier experiences. Industrial ecology is a promising concept if we manage to include real natural sciences as the foundation for how we make use of "the influence of economic, political, regulatory, and social factors on the flow, use and transformation of resources". The long term effects on the environments must make the basis for all decisions. If we manage this, then maybe industrial ecology can be a vector of change towards sustainability.

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