Harry Potter and the Ecologist's Thesaurus: DIACES 2002

Filip J.R. Meysman, The Netherlands Institute of Ecology, Korringaweg 7, 4401 NT Yerseke, The Netherlands; f.meysman@nioo.knaw.nl; **Linda M. Campbell**, School of Environmental Studies, Queen's University, Kingston, ON K7L-3N6, Canada, campbelm@biology.queensu.ca; and **Lynda C. Chasar**, US Geological Survey, WRD, 2010 Levy Avenue, Tallahassee, FL 32310 USA; lchasar@usgs.gov

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There is a strong similarity between the wizarding world of Harry Potter and the world of ecologists. In her Potter novels, J.K. Rowland has invented an astonishing vocabulary for the magical spells that endow Harry with supernatural powers (Encylopaedia of Spells, ES). As shown by the latest book of the series, the author's creativity for new enchantments remains unrivalled. As it happens, the same mesmerizing creativity can be found in the ecological literature, hinting at a deeper connection between magic and ecology. In the last 50 years, the discipline has been teeming with novel concepts, and as a result a compelling parade of new terms has entered the ecological lexicon. According to this eco-speak, ecosystems are governed by "drivers" and "stressors", while ecologists investigate their "resilience" and "stability", assess their "health" using "ecological indicators", and occasionally subject them to "restoration" and "rehabilitation" efforts. Clearly, some of these terms are as captivating and mysterious as Harry Potter's charms.

There is, however, one crucial difference. In Rowling's realm, each charm or curse is supposed to have an unambiguous meaning and perpetrate a well-defined effect. When hungry Harry visits the kitchen and utters "ALOHAMORA" (ES), the refrigerator door will swing by itself. In the world of ecology however, the case is rather different. When we ecologists try an "ALOHAMORA" equivalent, chances are slim the fridge will open up and produce its bounty. In fact, the effectiveness of an ecologist's abracadabra will be highly dependent on the type, brand and manufacturing year. In other words, ecological terms like "drivers" and "stressors" seem deceptively simple and logical when first encountered, giving the impression of having a well-defined, universal meaning. Yet, when we leave the comfort and safety of our own ecological research niche -- say, when an entomologist discusses ecosystem management with a sediment biogeochemist – we're headed for trouble. Organize a debate on the "health of an ecosystem" with a multi-disciplinary group of ecologists, and it takes only one devil's advocate questioning the "ecosystem health" concept to create a flourishing Tower of Babel within minutes. Rather than fostering fruitful discussion, our eco-jabber tends to promote confusion and outright controversy.

The perplexing power of this Multidisciplinary Babel of Ecology was nicely illustrated during the recent DIACES experiment (DIACES, Dissertation symposium for the Advancement of Coastal, Estuarine and Great Lakes Science, http://aslo.org/phd.html). Forty dedicated, eager and promising ecologists (all recent Ph.D. recipients) were carefully selected to represent the broad field of estuarine, coastal and great lake ecology. Participants were

isolated in the remote geographical setting of Guanica (a small village on the southern coast of Puerto Rico) and divided into four replicate groups. Each group was subjected to the same treatment, which consisted of forcing these inquiring minds (1) to define their pet ecosystem in terms of "boundaries", "drivers" and "stressors", (2) to find suitable, cross-system "ecological indicators" and (3) to report on their conclusions. Remarkably, the outcome was similar for all four replicate groups -- no end product was obtained whatsoever. Rather than taking the definitions for granted and forging ahead with their assignment, each group erupted into fierce and existential discussions about the basic meaning of the concepts themselves. It was readily apparent that "ecosystem disturbance" could mean something very different, depending on a scientist's perspective and background, not to mention the perspective and scale of the ecosystem under consideration. Basically, what followed was a highly exciting week of late-night discussions on ecological semantics, multidisciplinary chat sessions and peer networking.

In conclusion (and in all seriousness), the DIACES experiment confronted our group of young scientists head-on with the Multidisciplinary Babel of Ecology, which we identified as a real and undervalued problem within present-day ecological research. Dealing with this Babel requires the fundamental recognition that ecological concepts are inherently fuzzy. At present, ecology does not have the clear-cut laws or the same axiomatic structure as thermodynamics. As a consequence, ecological concepts tend to be more ambiguous than thermodynamic ones. Terms like "ecosystem health" appear to reside within the same league as the word "love". For thousands of years poets have struggled to harness the concept of "love" into words, and they are still trying. Moreover, everyone seems to have a rather well defined and highly personal idea what "love" is, yet no one shares exactly the same meaning. The same appears to be true for ecological terms - most scientists have an intuitive understanding, but individual interpretations may differ significantly in their details.

This is not to argue that all ecological jargon should be thrown straight out of the window. Our intention is simply to point out the strenuous, energy-soaking fashion in which communication takes place in a discipline that is becoming increasingly multidisciplinary. When "talking ecology" with peers from not-so-closely related fields, the message does not always cross disciplinary boundaries ungarbled, and as a result, we are often confronted with the same frustration as Harry when his charms let him down. Nevertheless, fuzzy concepts are not by definition worthless; the fact that the concept of "love" can't be harnessed into a discrete and consistent definition doesn't make it useless. Ecologists should be aware of the inherent fuzziness of the ecological terms they are employing, and hence, the associated dangers (e.g., knowing that our own interpretation of the term "restoration" does not necessarily coincide with the ideas of our colleagues). We should take care when coining terms and try to carefully convey the context in which our terms are employed.

The group discussions that erupted from the DIACES experiment proved a good illustration of the possibility of success in the face of dogged persistence. One quite diverse group that included scientists studying nutrient cycling, contaminant biogeochemistry, marine phytoplankton, sediment geochemistry, coral reefs and bacteria discussed "ecological indicators"

and the attributes of "good" indicators. After acknowledging that we were all looking at indicators from different scale perspectives, we agreed that communicating the results from studying a "good" ecological indicator would not only involve scientists, but also managers, policy makers and the general public (talk about brewing the ultimate Babel!). During freewheeling discussions and brainstorming, it was also concluded that a good, sensitive ecological indicator would have to be more than good -- it would have to be "groovy". In other words, understandable and attractive to all targeted audiences: interesting to the general public, important to policy makers, manageable to managers, while still meaningful to scientists. This idea of a "groovy" indicator resulted from comparing and contrasting each of the scientists, research systems, finding strong commonalities, and attempting to gain a deeper understanding of how scientists in other fields approached their research. In a final (and rather unexpected) eruption of consensus, it was decided that our resort's logo (the coquí, a diminutive tree frog endemic to Puerto Rico) effectively qualified as a groovy ecological indicator.

Unlike Harry Potter, however, the DIACES participants did not ultimately succeed in their quest for philosopher,s stone of ecology (i.e., a set of unambiguously defined and universally applicable ecological concepts). Fuzziness is inherent, and as a consequence, it takes time and energy to come to terms with ecological terminology. The less we communicate across disciplines, the higher the semantic barrier. The most important conclusion from the DIACES experiment, then, is that multidisciplinary contact between young scientists should be strongly encouraged and facilitated at every opportunity. It is only by grinding ecological concepts through the mill of interdisciplinary contacts that the fuzziness will be dispelled and deeper understanding emerges. And it is only by looking over these interdisciplinary barriers, by scrutinizing radically different ecosystems, governed by radically different processes over radically different temporal and spatial scales, that ecologists might eventually rival Harry Potter's success.

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