PERSPECTIVE

Interactive Ethics

Thomas R. Cuba

The Situation: *Where Will This Road Lead Us?*

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Your best client comes to you one day and says he has a truck outside. It is filled with barrels containing a mixture of heterocyclic compounds containing sulfur and nitrogen. Paraffinic and aromatic hydrocarbons as well as Carbene were also detected in the barrels. It even has two carcinogens, Anthracene and Pyrene, and it is all mixed into a sludge of Bituminous tars. He wants you to get rid of it for him.

You are not a hazardous materials transporter or arranger, but he is one of your very best clients and you would really like to help him out of this predicament. He's standing in front of you holding out the keys to the truck. You need to decide right now.

What do you do?

The Response

I must confess that this entire situation was a set-up. This time I was outdone by the readership. I had set up a situation with a surprise ending but one of the readers bested me. The response which meets all of the ethical criteria is this. You take the keys to the truck and sell the material in the barrels to the nearest paving contractor, for it is actually nothing but asphalt. I had gotten that far with it, but one astute reader advised that I should then return the sale price minus my fee to the client.

Science and the Environmental Profession

For our next installment I have decided to forego presenting a single situation and instead present a series of conflicts between our science and our profession. Conflicts may be too strong a word, so please take this presentation as it is intended—which is only as a stimulus to thought and not as a text book. Consider these instead as little vignettes of how our science is being affected by our business and our regulations.

I first became aware of this curious little *drift* in our science as an employer interviewing a new graduate for an entry-level biology position. I asked the candidate to explain the physiography and ecology of a cypress dome in order to get an idea of the depth of his knowledge. He was doing pretty well until he described the rim-ditch[1] as a natural feature. No matter how much I probed I could not get him to recognize the error of this and he rambled on postulating natural theories for their formation and expounding upon their ecological value. Ever since then I have been collecting these stories. I offer them to you now.

Continuing in the vein of educational drifts, I ran across a Masters degree holder who put in writing that the pH of unpolluted rainwater was naturally 7.0 because it was pure water.[2] The striking part of this story is that this person was the Principle Investigator on a very expensive study on acid deposition. Still on educationally induced drift is the generalization resulting from the massive applications of models to our natural systems. As the scientist is faced with the task of lecturing a topic for the umpteenth time it is possible to teach that two environmental factors are related or correlated and forget to mention that the standard deviation is huge and R^2 is only 0.6. The student leaves with the impression of a stronger relationship and is then confused when things don't match up. Fractal and fuzzy logic based advances not withstanding, the failure to explain the cumulative errors of using means in modeling theory can be dangerous. Finally, in a recent textbook I found a definition of the word *Extinct* as a species with no living representative OR one which had so few that there was no hope for recovery.[3]

Speaking of words, I find the use of the word *methodology* to be demonstrative of our lack of control. Method is the way we do things, the protocol. Methodology was first coined to convey the *-ology* of a particular method.[4] Yet we continue to see it used in the literature as the method itself. If we use methodology for method, what will we call the study of the efficacy of the method?

Moving my sights to government[5] I find a myriad of targets. First is the use of the Shannon-Weaver diversity index. Does anyone think of this as a tool any more? I find that many people could not calculate it if it were not in their stat-pack and only run it because of certain legal requirements. It is designed to assist the scientist in making a decision. It is used as the decision itself. Dissolved Oxygen is suffering a similar fate. We have a state law that says water with less than a certain dissolved oxygen content is "bad" and you can be cited and required to improved it. There are no provisions for temperature for starters, just the flat value or a daily average is considered. As a biologist, I know of many species which have developed over evolutionary time to have structures and organs and even blood to allow them to live in waters where the dissolved oxygen goes low and stays low for much longer than the law allows. Now if they evolved before people messed up everything one would tend to think that low Dissolved Oxygen waters might occur naturally and even be a part of the "system." It even raises the question that if we were able to re-oxygenate all these waters, would these specially adapted species be the next to be listed as endangered?

One respected government agent once advised me that the normal pH of rainwater was supposed to be 4.0. This was based on years of data from a non-attainment airshed instead of the national literature. He only became concerned if it dropped into the 3.x range.

Another example of the drift is in the *common knowledge*[6] associated with seagrasses. The literature is replete with studies that flatly state that Florida seagrasses[7] need a minimum of 24 centimeters of mucky sediments to survive and flourish. A casual snorkeling trip yields direct observations of seagrasses doing quite well rooted in the cracks of rocks with no more than a pinch

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of sediment and roots running through the micro-fissures. A careful review of the research shows that the literature actually refers to the depth of sediment needed for the *transplantation* of seagrasses, not the survival. Could it be that the common application of the science has changed the common understanding of the science?

Yes, it is true that these grasses growing in rocky areas don't form the dense beds that form in muddy sediments. There are corals and algae attached to the rock outcrops and gorgonians waving in the currents. Crabs and octopus may inhabit larger holes in the rocks. But this brings us to another point of reference. Seagrass meadows are praised for their diversity and production. "Meadow" is a word borrowed from the range scientists and the meaning is hugely different. In a meadow, there are hundreds of species of grasses and plants while in a submerged grassbed there may be three. Superficially, there is a resemblance as the grasses wave in the breeze or current, but how deep is that similarity?

In Florida we have a huge problem with exotic species and native species now often referred to as "nuisance" species. The exotics are lambasted because they form dense monocultures[8] eliminating the habitat diversity and the diversity of the understory and resident fauna. The "nuisance" species suffer the same fate because they also form monocultures.[9]

These species displace our natural heritage represented by such plants as our mangroves, seagrasses, lake grasses, sawgrasses, *Juncus* marshes, Maple and Cypress swamps, and sea oats; curiously all of which tend to occur as monocultures. So if the forming of a monoculture is bad, why are these plants good? Is it possible that there has been a translation of thought? The exotics do tend to eliminate faunal and subcanopy components but is it the status of being a monoculture that is bad, or is it something else? Do we not have a responsibility to think instead of pigeon hole?

Are we headed for a standard of practice that will follow in the path of the fast food cashier or the dominant operating system for our computers?[10]

And so to complete the circle, when discussing the differences between our science and our profession we recognize that our professional responsibility goes beyond the science and into what may be "best choices" for our clients based on laws, rules and convention.

Nonetheless, I ask: "Do we have an ethical responsibility to keep our science pure even though it may be applied in a less than pure manner?"

Notes

1. Cypress domes in Florida have been extensively drained by the digging of a ditch around the perimeter and then an outfall swale through the fields.

2. While there is some debate, the pH of unpolluted rainwater is often expected to be 5.2 or so because of the dissolution of carbon dioxide and other mild natural acids.

3. The added phrase is actually the "extinction threshold" and cannot be definitively determined until the species has gone extinct—it is in fact the result of a model.

4. The suffix *-ology* meaning the study of the root word.

5. Most examples are form Florida situations. I am sure you can find several within your sphere if you pay attention.

6. Once enough scientists have said something it becomes common knowledge and no longer needs to be cited or proven.

7. Primarily *Thalassia testudinum.*

8. Among other reasons, but this is the most often cited.

9. Nuisance species include native plants such as cattails, Carolina willow, cherry laurel, sugarberry, dogwood, and a variety of others which have done nothing more than to do well in poor habitats.

10. In both of these, even the English language and numbering system has been replaced with pictures and icons so that even the most ignorant can operate the machinery.

Send your comments to Tom Cuba, Delta Seven Inc., PO Box 3241, St. Petersburg, FL 33731; (fax) 727-550-2513; (e-mail) Delta-Seven@worldnet.att.net.
Watch for the response in a future issue of Environmental Practice.

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