



PALEOWORDS

by Jere H. Lipps

In the beginning was the Word The gospel according to St. John 1:1

Words are important. They are powerful and we first learned that in the school yard long ago. We knew that in spite of our mother telling us that “words will never hurt” us, those words indeed did hurt. As time went on, we tended to believe our mothers but only because our skin became tougher and we got looser with words ourselves. Words do matter, however. They matter a lot—a lot more than our mothers knew or we might sometimes realize ourselves. They can hurt, deceive, play politics, emphasize one meaning over another, or, like Presidents and Emperors sometimes do, they can sound perfectly honest but lie anyway. So it is in science too.

PaleoWords matter a lot. In paleontology, especially, words are our chief way of presenting data and conclusions because so much of the field is descriptive and interpretative. They are thought to communicate the methods, results and conclusions of our work accurately. Yet they might do much more. They influence oth-

ers to believe what we say, they confound and confuse, they put emphasis where it does not belong, and all in the name of science. Much of this in paleontology, I believe, is innocent, exuberant, or uncritical, but it does change the way our work is regarded. Often we employ words without care and without thought about their consequences. Sometimes we don't take the time to think of a good word, or maybe we're just in a hurry. Sometimes we use words because we used them in our hometowns when we grew up or because our teachers told us how to use them. Other times we are impressed with the words or with what they might indicate about us. We may want to join a particular bandwagon or follow a particularly outstanding or erudite person, so we copy his or her words in our own papers. Sometimes we think that by assigning a word to a phenomenon or idea it will make our idea even more impressive or important. All of these actions can lead to serious confusion and misunderstanding—exactly

the opposite of what scientific communication is supposed to do.

Before going on, I acknowledge that I do all of these things too, even though I verbally pound my students about writing well, writing clearly and writing honestly. Like you, I have the same human needs and lapses to do all of the things that I write about here. We all do it. That is all the more reason for care!

Maybe I have lost my sense of humor, but so many words nowadays seem to be misleading or confusing. We don't need that in our work and we should be careful about what we write. Clear communication should be our first goal in writing. Literary license and pretentious intellectuality must take second place. Otherwise, we have a community of paleontologists who spend a good deal of their time guessing at meanings in each other's papers and responding with commentary and research that is misdirected. An even larger body of biologists and students may not understand either. This is tragic in a small way, for so much valuable time and energy are lost, sometimes for decades while the community or our students figure it all out.

Research is commonly considered to be what we do in the field, lab or office, but without clear communication, all that work is worthless. Our foremost task, as researchers, is to communicate our research clearly. That is especially true in disciplines like paleontology, geology and biology where so much data and so many phenomena interact in innumerable different ways that must be presented in writing.

Paleontologists use words in four ways that are particularly troublesome.

First are words that disguise or confuse their real meanings; second are words that are meant to describe but that actually do other things, like emphasizing the wrong concepts; third are foreign words inserted into our English (or other,

for these observations should apply to writing in any language); and forth are words that are "cute". I take my examples from recent literature but do not identify the sources, because we all do these kinds of things and I do not want to focus on the perpetrators but on the words themselves.

First are the words that disguise or confuse their real meanings. These usually catch on because they seem to represent something more profound and more important than previous words or concepts. One of the greatest of word battles has taken place in paleontology and biology, for many, many decades, over "species". Many paleontologists and biologists seem to think or imply that a species is really a concrete object, no matter how it is defined. However, a species, whether described or merely listed, is actually a hypothesis. We cannot be certain that our species are real, functioning entities, so they must remain hypotheses. Like all hypotheses, they are subject to testing and elimination. The various nomenclatorial codes acknowledge this too, although as rule books they do not focus on the nature of species. If, in describing species, we treated them clearly as hypotheses, the fighting over species recognition and definition might have been tempered. The battles I witnessed between systematists involve all the human attributes: egos, rewards, fame in a small way, but seldom scientific progress. In paleontology we have relied on morphology and stratigraphy for species recognition, but we are about to see a new view of species that many people are unlikely to find appealing. A group of molecular phylogeneticists are proposing that species, no matter how they are defined or debated, do not exist at all. All that exists is lineages, and what we see as species at any time during the history of a lineage is simply part of that

continuum. They even go so far as to propose other ways of designating these, for they recognize that names are useful, although misleading most of the time. While this is causing distress in some circles and probably will in paleontology, we should be able to deal with it reasonably because we already understand about lineages. I rather expect another war of words, however. I hope we will keep our words clear, without hidden meanings or emotion attached to them. These are all hypotheses to be tested, not battles we must lose or win. In this case, emotions are likely to interfere once again, not the science.

Another word used commonly by paleontologists in particular is “macroevolution”. Other biologists apparently are confused about why we use this word (see Carroll 2001). Some of us are too. Does it describe a pattern or is it a name for a process or processes? Its complementary “microevolution” represents processes that take place in populations. “Macroevolution” is not clear or consistent in our literature. Everyone has a somewhat different take on what macroevolution seems to mean. Any of these several views may well fashion whole research programs, simply because the word sounds important and distinguishes large-scale changes from smaller-scale changes, not because it is clearly understood. The concept remains obscure or confusing, in spite of many texts written about it in recent years. “Macroevolution” seems likely to Carroll and to me to be so vague or inclusive of so many other phenomena that it now obscures much of what we want to learn about evolution. Maybe we should abandon both “microevolution” and “macroevolution” as distinctive modes, mechanisms or definitions, and return to the one word we all seem to understand

and that encompasses both ideas, “evolution”.

Other words, intended to be descriptive, are simply confusing. These are commonly substituted for more descriptive terms, when such substitution is not necessary or justifiable. They are annoying but can deceive as well. What they seem to indicate is often illusory. For example, recent papers discuss “disaster species” as those that pass through an extinction event and then proliferate into new “ecospace”. That tells me nothing and confuses me a great deal. Both “disaster” and “ecospace”, although popular, attempt to define but in reality confuse. Using them both in the same sentence compounds the difficulties. The problem is that each carries clear conceptual images that are not based on reality. Somehow a “disaster species” is associated with a disaster, but we cannot be sure that the organisms themselves would ever have recognized the disaster or that one even occurred. After all, the species survived. The term disguises a significant ecological change of some sort and it has already told us that it is a “disaster”. That’s not fair and it’s confusing. A simple description is needed, not a word loaded with interpretation. “Ecospace” has been around a long time. It means nothing significant, but it does mislead significantly. It implies that the environment is somehow partitioned into “spaces” for various ecological attributes of a species (or lineage!). How can that be? It may well come from our use of “ecological niche” as a part of the environment rather than an attribute of a lineage (or species), as it was originally intended. Thus, there can be no empty “ecospace” or “niches” just waiting for some organism to fill them. These things don’t exist until an organism evolves or migrates to define them. Whereas “disaster” and “ecospace” may well be handy labels, the baggage

they carry and images they promote lead not in the direction of sound hypotheses development and testing, but to dogmatic and erroneous conceptualization.

A good rule is: Use simple descriptive terms instead of these kinds of words for objects or phenomena, and then interpret what they mean later. Don't incorporate an interpretation into the description or word itself. The usual pattern is something like this: A graded bed of sandstone with plant material in it is branded a "tsunamiite" because it occurs at the K/T boundary, from which a conclusion is drawn that there was a tsunami resulting from an impact. Circular reasoning or predetermined inference ensues because interpretation gets mixed into the description. Description first, interpretation second.

I remember a student who wrote in his thesis that "hordes of echinoids were moving over the sea floor". We argued about the use of the word "horde". He said it meant "large groups" of his echinoids, but I objected and thought it was not informative at best and misleading in general. He thought it made for a more "literary" presentation that was easier to read. That, I emphasized, was not our purpose. We were trying to communicate science, clearly and concisely, and "hordes" did not do that, no matter how wonderfully it sounded. We finally decided that the dictionary should settle the matter. "Horde", in the Oxford English Dictionary (2nd edition) is by first definition a clan or tribal group of Mongolian nomads. He agreed that's not what he meant! A later definition was any crowd, swarm or pack, perhaps closer to the several dozen echinoids he had seen. Still bad words, for all of these imply something about the nature of the behavior or aggregation of echinoids that was unknowable and not even part of the thesis. I would prefer "large number", "several dozen", "many", "innumerable", or any

other term that describes numbers of organisms, over any of the other words that have added meaning.

Foreign words used in another language seldom lead to clarity, yet we have sometimes embraced them wholeheartedly in paleontology. Take *Lagerstätte*, as a primary example. The word, copped from Seilacher's (1970) German paper, means nothing more than "deposit". As Graham Shields (1998) wrote, the word has been used in many different ways, I suspect as a kind of shorthand for occurrences we don't always clearly understand or, as Shields suggested, as a way to sound more exotic or polished. Its use has confounded a generation of young paleontology students and confused many of the rest of us. Shields correctly noted that we have perfectly good words in English that substitute directly for Seilacher's *Fossil-Lagerstätte* and *Konzentrat-Lagerstätte*. In fact, English is so flexible that we can be even more precise in describing the various kinds of fossil deposits than simply referring to them with a German word. Had we done that, a good deal of the "constantly variable interpretations", as Shields said, would have been avoided and clarity advanced. A good rule: Stick to one language when writing—it is clearer and it is bound to be better understood in context. I realize that English has taken over many concepts in other languages too. I don't think an English word intercalated into a German sentence is any more helpful than the reverse. There must be good words or sets of words that will suffice in any language.

Then there are words that are merely cute. The front cover of *Geology* is particularly painful. On nearly every cover are cute expressions that have nothing to do with the article they refer to, but either sound neat or are eye-catching. They are perhaps used to make the journal more

“friendly” or, as in certain tabloid publications, to attract us to things we might not be attracted to had we known the real content in advance. I don’t think this kind of notice is useful in an international journal. For example, articles on “Baja B.C.” are announced on the cover. What is Baja B.C.? It’s “lower” something, my Spanish immediately tells me. Now I have to finger my way through the pages to discover that Baja B.C. is southern British Columbia, a place where the word “baja” has seldom been heard. It was just a combination that someone thought was funny. I was annoyed, not just for myself, but for all the poor people who had no idea what that was all about. Imagine the Chinese paleontologist with correlative rocks, trying to figure that one out by flipping the pages of his English–Chinese dictionary. He’s unlikely to get it. Or even the Latin American paleontologist who knows it’s lower something or other but can’t imagine, like

me, what the B.C. stands for. Another recent issue lists “Cretaceous hot tub” on the cover. I went immediately to those pages thinking that the paper might discuss Cretaceous hydrothermal vents or pools. No, the paper actually dealt with warmer-than-expected (but not hot) Cretaceous seas. I don’t see the fun or attention-grabbing aspects of this kind of headline. It misled and wasted time. Headlines should inform us accurately. They can be fun too, but they should not confuse the readers. We write for an international audience, and our international journals owe it to the world’s readers to inform them accurately and not to waste their time by being cute.

The potential for using words that cause obvious or concealed problems are great indeed. We should write simply, write clearly, write honestly, and write concisely. We will understand each other better, and make progress just that much faster.