

Nuclear Waste Fallout

To the Editor:

I was shocked and dismayed that the *MRS Bulletin* [Material Matters, "Toxic Government versus Toxic Waste," January 1995, p. 4] would deviate from its normally impeccable and balanced choice of authors and subjects to publish John Horan's vicious diatribe against environmentalists and government regulators, which runs through a litany of condemnations ending with the all-caps exclamation, "DETOXIFY GOVERNMENT!" that reminded me of the similarly sensationalist style of propaganda issuing from extremist groups of both the right and the left wing. One example of the many outrageous and irresponsible comments that Horan makes refers to how "fission products created over billions of years ago had remained near their place of generation," clearly implying, in the context of the article, that ours will do likewise without all this fuss about encapsulation. He goes on to say later that it is unreasonable to hold them still until they have decayed, and that down the road someone's likely to figure out a better way of dealing with them anyway. Of course, that was the attitude of the weapons builders of the '50s who created a large part of our present mess. I, on the other hand, feel that it is even more unreasonable, as well as grossly irresponsible, to pile up waste for future generations to deal with. Mother Nature, whose mode of operation he liberally cites to support his position, has succeeded for time immemorial by unfailing adherence to the fundamental principle that absolutely everything is recycled. It is obvious that any violation from this ultimately destroys sustainability, yet our industrial civilization is rampant with such violations to the point where the air in many cities is repulsive to breathe and where the fish in many waters are dangerous to eat.

Building up steam and venom, Horan goes on to talk about the "modern baggage of a republican form of bureaucracy." This chilling quote is one of the clearest calls for regression to dictatorship government that I have ever seen in a professional publication. If the popular

press picks up on this (don't worry, I won't tip them—I care about MRS), our reputation as a respectable organization and our influence in Washington will be severely marred. Of course our form of government is inefficient. That's what happens when government tries to consider everyone's viewpoint and needs. Do we want to stop doing so? I hope not! Horan goes on and on about this inefficiency, but he offers not a single concrete suggestion for how to improve the situation. The tone of the article sends the clear message that he would just like to see all the regulators and "quasienvironmentalists" go away and let industry take care of things. This hopelessly naive attitude totally neglects the Corporate imperative that profit comes first. The sense of social responsibility that we would like to see steering Corporate decision-making is obviously not strong enough to prevent serious environmental degradation, and we have enough dramatic and depressing examples of this fact in the free market by now to have learned this lesson well.

Horan does make one good point in the article, but it is largely lost in the extremist and negative rhetoric. The point is that we should be paying more attention to putting our cleanup and public-health dollars where they will do the most good rather than draining them in litigation or pumping them into squeezing out the very last nanogram of contamination from a particular site. This is a point on which I would expect broad consensus among both environmentalists and industry, but unfortunately Horan's article will do far more to polarize these two communities from each other than to rally them around this common principle. I hope that *MRS Bulletin* will try to save the situation by publishing soon either a rebuttal or an apology.

Donald L. Smith
Xerox Corporation, PARC

Response:

As chair of the *MRS Bulletin* Editorial Boards, I am often privileged to see advance copy intended for later publication. Donald L. Smith's letter to the editor

appearing in this issue came to my attention through this Editorial Board role. I comment on it not only because the Boards have an overall responsibility to assess editorial balance for this publication, but also, in particular, because I was personally involved in inviting the editorial commentary by John Horan about which Smith so vociferously complains.

I leave any expression of opinion about the substantive aspects of the views of Horan and Smith to readers with expertise in the radioactive waste field. My response is pointedly to Smith's "shoot-ing the messenger," in this case the *Bulletin*, for having printed the Horan piece. He accuses the *Bulletin* of deviating from its usually impeccable and balanced choice of authors and subjects. He associates the *Bulletin* and MRS itself with what he characterizes as Horan's call for a dictatorial form of government and warns that MRS's reputation is at risk. Finally, he suggests the *Bulletin* can recoup its losses either by publishing a rebuttal or an apology.

First, it is quite clear from the context of the Horan editorial that it is an opinion piece as are all the articles published in the Material Matters column of the *Bulletin*. Nowhere is an endorsement for or against the stated opinions given by the *Bulletin* or the Society. Second, Smith complains about dictatorship and praises the less efficient approach that tries to consider everyone's viewpoint and needs. At the same time he fails to see the contradiction as he castigates the *Bulletin* for failing to censor its own content. His suggestion that a rebuttal be run is well taken and I have no doubt *MRS Bulletin* will publish differing views when submitted. His alternative suggestion that the *Bulletin* apologize is diametrically opposed to what a balanced, fair, and open publication should do. I would be the first to apologize to all our readers including Donald Smith if we had, for fear of controversy or political incorrectness, refused to print John Horan's editorial.

Elton N. Kaufmann
Chair of the *MRS Bulletin*
Editorial Boards



Send Letters to the Editor to:
MRS Bulletin, 9800 McKnight Road
Pittsburgh, PA 15237-6006
fax: (412) 367-4373, e-mail: Bulletin@mrs.org

Letters must include your full name, institution, address, and phone number.

“Functionally Gradient Materials” Not Grammatical

To the Editor:

I must object most strongly to the ungrammatical title which you have chosen to put on the January 1995 issue of the *Bulletin* [Functionally Gradient Materials].

Functionally is an adverb and can only modify a part of a verb. *Gradient* is a noun and, as far as I know, has no usage as a verb. The appropriate phrase must, therefore, either be *Functionally Graded Materials* or *Functional Gradient Materials*.

Solecisms like these do not help in the development of correct and understandable communication, which is as important between scientists and engineers as for any other group in society.

P.J. Goodhew
The University of Liverpool

To the Editor:

My felicitations on the continued very high standard of the *Bulletin*; its arrival is something I look forward to each month.

Forgive me if I communicate a minor gripe. In the January issue, there was a group of articles under the collective heading *Functionally Gradient Materials*. I know this curious phrase has insidiously slid into general use, but that does not change the fact that it is not English! The Oxford English Dictionary makes clear that “gradient” is not an adjective in this sense; indeed, it is no longer used as an adjective in any sense. If, in that phrase, “gradient” is regarded as a noun, then the phrase is complete nonsense, since an adverb cannot qualify a noun! The proper term is *Functionally Graded Materials*, and this will be the title of Prof. Hirai’s detailed chapter on this subject in the forthcoming Volume 17 of the book series, *Materials Science and Technology*, of which I am an editor-in-chief.

More and more linguistic solecisms creep into scientific publishing with every year that passes. We find “data is,” “the media publishes,” to name just two. Of course, the name of our own “mystery,” *materials science*, angers certain purists, who render it in print as *material science* or as *science of materials* (as did Oxford University for some years). That minor skirmish has to be given up as lost, but I guess that is no reason for accepting fresh linguistic monstrosities!

Robert W. Cahn
University of Cambridge

Guest Editor’s Response:

Scientists should indeed question the name given to an emerging field of study; however, concern over the grammatical correctness of the term *functionally gradi-*

ent materials is, in my opinion, neither the most important nor the most interesting issue here. To the scientific community, in any case. My linguist friend Mary Ellen Ryder enjoyed explaining to me that grammatical correctness is seldom cut and dry, and that the noun *gradient*, like almost any noun, can function as an adjective, which could then be modified by the adverb *functionally*. The real question, she thought, was exactly what *functionally gradient materials* refers to, and whether it does so effectively.

More importantly, and irrespective of its debatable grammatical correctness, is the fact that the term has found widespread usage, which by definition makes it part of the English language. Further, whether the term is grammatically correct or not has little bearing on whether it is clear and understandable. Effective communication is the goal of language, and we must recognize and accept that languages evolve, constantly changing to reflect the needs of those who use them.

I agree with my linguist friend. The interesting questions are ones about the origin of the term, the reason, meaning, and appropriateness of referring to it using capital letters, and whether in fact the name provides an unambiguous description of this field.

The phrase *functionally gradient materials* originated several years ago in Japan, where English is not the primary language, and in recent years seems to have become widely adopted in other countries. Among others, the terms *functional gradient materials* and *functionally graded materials* have also been used, along with the acronym *FGM*. Interestingly, at the conclusion of a presentation during a recent international conference, an informal discussion took place regarding naming of these materials. Since those present seemed to clearly understand any of the commonly used terms, imposition of a standard was deemed unnecessary.

Personally, I submit that all materials are indeed functional in one sense or another. Further, since function is irrevocably tied to structure, usage of this word to modify a structural descriptor such as *gradient* does not further clarify or add anything substantial to its meaning. It could also be argued there is little justification for referring to these materials formally, and that, similar to the way we refer to *electronic materials* or *biomaterials*, usage of the informal term *graded materials* would be more appropriate in most instances.

Barry H. Rabin
Co-Guest Editor
MRS Bulletin
January 1995

Editor’s Response:

I am of the philosophy that if the English language is clear and concise when used correctly, we have no need to create new terms—unless they truly do the job better. Whether relying on strict English or more commonly used English, I find *functionally graded materials* (or just *graded materials*) to be the clearest way to describe these materials, with no controversy about grammar.

However, our decision to run the title was not from carelessness; rather, we went with the name coined by the researchers in the field. As an example, of the many articles included in the January *Bulletin* issue, the term most consistently used—by far—was *functionally gradient materials*, with only a few authors using *functionally graded materials* or *structures*. Other authors chose to use FGMs, never spelling out the term at all. I found similar use of *functionally gradient materials* for symposia titles and other journal articles.

So, while we were aware that the title was not grammatical in a strict sense, the term apparently was established and recognized in the field. Now I see that the materials community has not yet reached consensus on a term for these materials.

The Letters to the Editor on the title of the January issue may have been about grammar, but to me they elicit a broader question: Who should coin new terms as technology and new phenomena develop? The scientists or the editors? Perhaps the scientists should coin new terms judiciously, and the editors should edit them (running the edited version by the author, in our standard fashion).

And looking beyond grammar, how does terminology translate across borders in a multilingual research community? How should new and modified (“edited”) terms be tracked through their evolution? Who, within the research community, has the power to originate a new term? And, do others in the research community have the authority to change the term of the originator?

Language—particularly in an interdisciplinary field like materials with an international constituency—is not always as simple as looking in a dictionary or style guide. So, as language develops to keep up with technology, all we can do is focus on clear communication—the true purpose of language.

E.L. Fleischer
Editor, *MRS Bulletin*