

SCIENTIFIC JARGON, GOOD AND BAD

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ABSTRACT

Scientific and technical jargon—specialized vocabulary, usually Latinate—plays a vital role in scientific and technical communication. But its proper use continues to be a point of discussion because of our concern with audience adaptation, rhetorical exigence, rhetorical purpose, and ethics. We've focused on teaching students—and on convincing scientists, engineers, and other writers/speakers—to gear their specialized language to the recipients of their communication, to the occasion calling for their communication, to what they wish to accomplish through their communication, and to the ethical goals of safety, helpfulness, empowerment, and truth. These are exactly the sorts of things we should be doing. My contribution to this conversation is a reinforcement and, I hope, an extension of the argument that we should also be teaching and convincing students and professionals: 1) to fully appreciate what makes jargon either good or bad; 2) to carefully distinguish jargon usage from other aspects of scientific and technical style; and 3) to recognize that in every context, even in communication among experts, jargon should be used judiciously—that is, in the most helpful, least taxing way.

Jargon, i.e. scientific terminology, is essential for designating new entities for which the language has no name. It makes for economy and for the accuracy and precision required in scientific research [1, p. 319].

Does the excessive use of technical terms impede the advance of science? I think it does. It kills the grace and purity of the literature by means of which the discoveries of science are made known [2, p. 116].

What if it should turn out that we are all jargon makers and jargon users, and that jargon is necessarily involved in the growth and change of language? That we are consumers of jargon as we are eaters of sliced bread? [3, p. 3].

To attempt a definition of jargon threatens unusual dangers [4, p. 69].

The above epigraphs are glimpses into discussions about both the uses of jargon and its definitions. My article enters in on such discussions, offering a point of view about the definitions and about the proper uses of jargon.

INTRODUCTION

The word "jargon" has several meanings, but currently the two main definitions are: 1) the specialized language of any trade, organization, profession, or science; and 2) the pretentious, excluding, evasive, or otherwise unethical and offensive use of specialized vocabulary. Unfortunately, the neutral sense of jargon is often shouldered aside by the negative sense. This causes confusion and, sometimes, offense. My colleague Jonathan Lighter, editor of *Random House Historical Dictionary of American Slang*, tells me that the word "slang" carries in its wake similar confusion and offense because it, too, has two main definitions, one negative and one neutral [5]. In the case of "jargon," the confusion deepens when people use this single term to denote a wide variety of stylistic infelicities. The offense deepens when scientific and technical language is used in legitimate ways and is still called jargon in the pejorative sense—or when a communicator feels this sense directed at his/her writing or speech even when the neutral sense is (ostensibly) being applied.

Speakers of English have been discussing the "uses and abuses"¹ of specialized language for hundreds of years. For the most part, this conversation has focused on the merger of Latin (and Greek, largely through Latin) with Anglo Saxon, and on the proper or most stylistically effective use of the resulting Latinate and Latinized terms. The discussion is especially relevant to scientific and technical communication because such vocabulary plays a vital role in this field.

I recommend that scientists, engineers, journalists, technical communicators, and everyone involved in writing, editing, and exchanging scientific and technical information use the phrase "good jargon" for proper and effective use of scientific and technical terms, and "bad jargon" for showy or shoddy use of such language. We should also carefully distinguish jargon from other common features of scientific and technical style, such as overuse of passive voice and nominalizations, "sentence fat," modification problems, and so on.

¹ Walter Nash (third epigraph) wrote an excellent book entitled *Jargon: Its Uses and Abuses*. By *Uses* Nash means the legitimate use of specialized language by various trades and sciences, what he later calls "shop talk." The same words used pretentiously are *Abuses*: "show talk" [3, pp. 3-12].

Finally, we should bear in mind that the specialized Latinate vocabulary of science and technology usually taxes our brains more heavily than Saxon words. In scientific and technical communication, this is often necessary. But where less taxing words are precise enough, they almost always make for better style, even as used among experts.

THE PROBLEM IN MORE DETAIL

"Jargon" derives from Old French *jargon*, *jargoun*, *gargon*, *ghargun*, and *gergon*, terms referring to "the inarticulate utterance of birds, or a vocal sound resembling it; twittering, chattering" [6, p. 1502]. Certainly, when we don't understand, or must struggle to understand, the technical or specialized language someone is using, this sense of "jargon" applies. The speaker or writer of such words may be motivated by pride, by a desire to deceive, or simply by a disregard for our comprehension of his/her discourse. Consider words such as reticuloendothelial, stochastic, autochthonous, thermogravimetry, oligogenic, dichotomous, fluvioterrestrial, and hypertriglyceridemia. When we hear or read such words, especially when they come at us thick and fast, we may start regarding them as jargon or call them technobabble, scientese, tech speak, or some other subset of jargon.² And in some cases, the negative connotation may be deserved.

But perhaps some people who hear twittering just haven't learned the legitimate vocabulary of Bird. As I pointed out, the word "jargon" can also simply mean the specialized vocabulary of any organization, profession, trade, science, or even hobby. In this sense, it is neutral,³ it carries no negative connotations. It may even have a positive sense in a sentence like "Attendees appreciated her precise and judicious use of scientific jargon."

² In his chapter "Handling Technical Terms and Jargon" in *Technical Writing Style*, Dan Jones lists about 20 words—computerese, engineerese, bureaucratese, governmentese, bafflegab, doubletalk, bureau quack, etc. [7, pp. 120-121]—that he regards as subsets of jargon. Jones acknowledges that one meaning of jargon is neutral ("Like technical terms, the term jargon applies to the specialized vocabulary of a trade, profession, hobby, or science"), but he uses the word in its negative sense: "terminology used inappropriately for an audience" or "pretentious or unnecessarily complex words" [7, p. 120]. In Richard Weaver's jargon, "jargon" is for Jones a Devil term, or something approaching it. Jones's God terms (as it were) are "technical terms," "technical terminology," "technical language," "scientific terms," "scientific terminology," "scientific language," and "specialized language." We might also project "specialized terms" and "specialized terminology" from this set. Of course, such terms/terminology/language must be handled appropriately, as his chapter title suggests, or they become jargon. Jones's book is excellent, but in the chapter referenced above, wouldn't it be easier just to contrast "bad jargon" to "good jargon"?

³ Katherine Rowan, in her article on differences between professional and popular science writing, notes this under her subhead *Jargon*: "Jargon has several meanings, one of which is neutral and the other negative. Neutrally defined, it refers to the 'technical terminology or characteristic idiom of a special activity of group'; its negative definition refers to the inappropriate use of 'obscure and often pretentious language marked by circumlocutions and long words'" [8, p. 171]. She cites the 1986 edition of *Webster's New World Dictionary*.

Which sense of the word is more commonly meant today, the negative or the (at least) neutral? I'm not sure. Perhaps the race is close, but as I said, I think the negative sense is out in front. A quarter century ago, Jimmie Killingsworth opined that to say "That's jargon" amounts to saying "That's bad." But as Killingsworth also noted, to point at something and say "That's jargon" is "a rather inadequate judgment because of its own abstraction and range of possible meanings" [9, p. 108]. Killingsworth coined the term "thingishness," an admittedly ugly word he used to describe "the most unreadable, pretentious, contextless, and demanding of technical styles. It comprehends a variety of ugly conditions of language: nominalization, strings of noun modifiers, passivity, indirectness, impersonality, and unrelieved abstractions" [9, p. 105]. That's the sort of list we get in many articles on stylistic problems in scientific and technical communication.⁴

I agree with Killingsworth that we—technical communicators, scientists, engineers, managers, general public—need a concrete definition of jargon and that we need to separate out all the "ugly conditions of language" and deal with them separately, apart from the issue of jargon. That is, we must distinguish jargon from other stylistic features commonly called jargon or lumped in with the term, and in so doing, we should clarify and agree upon a primary definition of the word. We should be careful even with our metaphorical or playful uses of the word.⁵

I think it would be valuable to endorse the definition of jargon that is at least neutral if not positive. Those who master the jargon of their fields and use it expertly—that is, helpfully, accurately, judiciously, masterfully—should be honored for their accomplishment, and the word we use to describe the specialized language they use so well should carry no worse than a neutral sense. I think writers and editors would do well to use the word this way and to convey that sense when communicating with scientists and engineers and everyone else. When we wish to indicate a better or worse status for particular jargon words or particular uses of jargon, we should say "bad jargon" or "good jargon."

I realize that if the popular meaning of "jargon" is negative and if I (and my fellow rhetoricians and tech comm specialists) use it in another sense, I am making the word itself into a jargon word. But I am not arguing for a whole new,

⁴ Other good examples are "Why Engineers and Scientists Write As They Do: Twelve Characteristics of Their Prose" by George Schindler [10] and "What Makes Bad Technical Writing Bad? A Historical Analysis" by Elizabeth Tebeaux [11].

⁵ Readers of *Technical Communication*, the journal of the Society for Technical Communication (STC), will remember Fern Rook's delightful explanations of various features of English grammar and mechanics that appeared in her column called *Slaying the English Jargon*. These pieces were accompanied by a drawing of a knight attacking a dragon ("dragon" sounds like "jargon"; see?). Rook titled and illustrated her pieces on grammar in this playful way in order to signal that she was writing about a technical subject (grammar) in a non-technical way: she was "slaying the jargon" by writing in plain language so that non-experts could understand. *Her columns did not discuss jargon per se*. But the fact that her pieces appeared under a heading about slaying jargon may have contributed to the confusion of that word with various other "conditions of language." STC published *Slaying the English Jargon*, a collection of selected Rook pieces, in 1983 [12].

"specialized" meaning of the word; I am simply arguing for the primacy of a precise and consistent meaning that already exists in all the popular dictionaries. Admittedly, I am arguing as a professional who wants to clarify and promote the meaning of a particular word because it is important in my thought, in analysis and manipulation of materials (text), in instruction of pupils in my specialty, and in exchange of ideas with other specialists. These sorts of concerns are common among specialists. I am also concerned about my relationship with professionals in other fields, and I certainly don't want to insult them—at least not unnecessarily.

About a decade ago, I served a faculty internship in technical communication at the Oak Ridge Reservation (of Manhattan Project fame) in Tennessee. Martin Marietta Energy Systems, the company then managing the reservation, required all documents produced on the reservation (more accurately, all documents destined to end up outside the reservation) to pass through an editorial cycle. Documents produced by scientists and engineers—for brevity, let's call them all scientists—came into the hands of technical writers and editors, who wrote and edited all over those documents.

This would seem an entirely acceptable state of affairs, and generally it was. Many of those scientists were grateful for the improvements made to their documents. But at times, I sensed an underlying tension between the professional scientists and the professional communicators. In essence, the tension arose from the scientists' conviction that they, the scientists, were the real experts in everything that had to do with their fields, including communication. The emotion I sensed in some cases was mixed fear and annoyance that the writers might touch something they should not touch in the scientist's precise, important, correct document. It was the sort of feeling scientists might also bear towards a layperson who had entered their laboratory and was wandering among carefully stacked petri dishes and neatly marshaled test tubes.

On the other side of the equation, the emotion flowing from the tech writers was, at times, frustration with the scientists' disregard for (or even outright resentment towards) the tech writer's craft and contribution.

Consider this unfortunate scenario: a scientist has just left his precious MS in the hands of an editorial supervisor at a major national laboratory. As the scientist walks off through the hallway, he overhears the editor saying to a colleague, "Welcome to Jargonville." The scientist sets his jaw. Later that day, the same scientist reads a newspaper in which local citizens are complaining about the fog of scientific jargon that makes it so hard for citizens to understand what's going on out at the Lab. Slow camera zoom; again the hard-set jaw.

There are many reasons why this kind of tension exists, and to treat the topic fully, I'd have to write something like C. P. Snow's *The Two Cultures* [13], but the second culture wouldn't be humanities, it would be "non-science," and the book would be a lot longer. So, for the purposes of this article, I'm going to limit my discussion to a single tension-creating element, something I believe can be reduced if both sides will agree on the meaning and value of a single term: jargon.

Tensions will further relax, of course, as both sides get better at using jargon judiciously. To use jargon judiciously means to use it in the most helpful, least troublesome way.

THE SCOPE OF THIS ARTICLE

I limit my discussion not only to the single "condition of language" we call jargon, but specifically to the specialized language of science and technology. There are, of course, many other specialized vocabularies. For example, the word jargon embraces the special or technical language of law and finance. A great deal of valuable literature⁶ deals with the "plain English" movements generated in recent decades in response to the public's unpleasant experience with the jargon (and other stylistic, as well as organizational and visual features) of legal and financial documents (contracts, public safety announcements, consumer reports, etc.). I limit my article to exclude these concerns for two reasons: one, if I don't, my article will be much too long. Two, the plain language or plain English movements are designed primarily to serve "the poor and poorly educated," those "least able to deal with the complexity of legal documents," and also those often standing in need of basic literacy instruction [15, p. 26]. My article focuses on jargon in science and technology and presupposes literate, college-educated audiences.

I add that my exploration is confined to jargon and its use as part of the English language.⁷ I do not consider jargon usage in other languages *per se*, though of course the "language of science," as it is often called, does have a nearly worldwide presence in scientific communication. By the way, by "language of science" I do not here mean mathematics; I am referring to the specialized Greek/Latin words used in science and technology.

The phrases "language of science," and "scientific language," are common in many books and articles on scientific and technical communication,⁸ but let us recognize at the outset that the specialized vocabulary of science and technology does not constitute a separate language standing apart from English. Though most jargon used in our scientific and technical professions is based on the Latin language, and on ancient Greek through the Latin, its appropriation, historic and current, is just that: an appropriation into English—and of course into other languages as well.

The appropriation I speak of is a huge one, and our Latin heritage has profoundly influenced the development of English since the Norman Conquest (1066)—and long before. But I refer here, under the general category "jargon," to

⁶ See, for example, Steinberg's collection of 18 essays on the subject [14].

⁷ My discussion of jargon would be different if I were considering its use in a Romance language. See for example Emily Thrush's study of "plain English" guidelines as applied to *French* speakers [16].

⁸ See Wilkinson [1], for example.

the many thousands of words and phrases appropriated from Latin and Greek in order to name (or re-name) the tools, machines, processes, substances, structures, properties, causes, effects, laws, objects, animals, minerals, and vegetables that scientists and technicians study and manipulate.

So then: the words and phrases invented and appropriated by science and technology do not constitute a separate language, nor can "scientific language" in any sense, broad or narrow, legitimately stand aloof from the rules of good style that govern other kinds of discourse. Of course, scientific and technical discourse in its various manifestations does have legitimate distinguishing features, including accepted methods of arguing, organizing, illustrating, and designing communications. These are not the ugly conditions of language to which Killingsworth alluded, nor are they within the scope of my article. My focus is on that particular aspect of scientific and technical discourse we call "jargon"—a feature that remains one of the most distinguishing, if not absolutely the most salient, conditions of scientific and technical communication.

Before we can go very far in thinking about the rules for good scientific and technical communication, we must understand clearly what jargon is and what it is not. That will allow us to separate the jargon issue from various other stylistic characteristics of scientific writing, and it will allow us to move on and contrast bad jargon to good.

SOME DEFINITIONS OF JARGON

Quite a few well-known stylistic theorists have used the word "jargon" in different senses from the one I'm using in this article, so I must deal with these different senses at some length. In fact, these different definitions lie at the heart of much of the confusion, and offense, felt by scientists who bristle when they think their legitimate use of language is being attacked.

Sir Arthur Quiller-Couch's *On The Art of Writing* (1921) contains a chapter entitled "Interlude: On Jargon." In it, he takes pains to define jargon—and to ridicule it; for him, it is an entirely negative term. It is "sham prose," "prose which is not prose" [17, pp. 83-84]. Its chief characteristics are circumlocution and "vague woolly abstract nouns"; says Professor Quiller-Couch, "To write jargon is to be perpetually shuffling around in the fog and cotton-wool of abstract terms" [17, p. 96]. He instances many sentences from government officials and even from literary figures, but he has the most fun by showing the effect jargonizing would have on Hamlet's soliloquy:

To be, or the contrary? Whether the former or the latter be preferable would seem to admit of some difference of opinion; the answer in the present case being of an affirmative or of a negative character according as to whether one elects on the one hand to mentally suffer the disfavour of fortune, albeit in an extreme degree, or on the other to boldly envisage adverse conditions in the prospect of eventually bringing them to a conclusion [17, p. 96].

And so on. This method of ridiculing "sham prose" was later taken up by George Orwell and others.⁹ Most of us have chuckled at Orwell's transformation of a well-known passage from the Bible into "modern English at its worst":

Objective consideration of contemporary phenomena compels the conclusion that success or failure in competitive activities exhibits no tendency to be commensurate with innate capacity, but that a considerable element of the unpredictable must invariably be taken into account [18, p. 360].

Compare, says Orwell, the King James version of *Ecclesiastes* 9:11:

I returned, and saw under the sun, that the race is not to the swift, nor the battle to the strong, neither yet bread to the wise, nor yet riches to men of understanding, nor yet favour to men of skill; but time and chance happeneth to them all.

These re-writes of passages from *Ecclesiastes* and *Hamlet* are dominated by a stylistic feature that teachers of composition and rhetoric describe metaphorically as "deadwood," "inflammation," "fat," and so on.¹⁰ I prefer "fat" (akin to Richard Lanham's "lard"¹¹), which carries the negative connotation I want in our diet-conscious culture. I use this word to indicate the unnecessarily difficult, unnecessarily long, or simply unnecessary phrases and words that clog the arteries of professional writing. *But the words and phrases to which I refer are not the specialized or technical terminology of a science, profession, organization, trade, or activity.* They are not vital for precision or universality or economy or any other goal of good jargon. Sentence fat is always bad, and so cannot be jargon, which is often good.

Here is another sentence laden not with jargon, but with fat:

Due to the fact that the compressor ceased functioning prior to our finalization of the work project, we informed the contracting party at that point in time that unless he agreed to convey a functioning compressor to our job site free of additional charge or cost to us, we would render null and void our contract with him.

It doesn't take a specialist—say, an engineer, a medical doctor, or a particle physicist—to understand that sentence, but it does take more mental energy than it should. The sentence exhibits all three categories of fat: fatty words, fatty phrases, and unnecessary repetition (pure fat):

- Fatty words: *ceased, functioning, finalization, informed, convey, additional.*

⁹ For a modern example, see "The Principles of Poor Writing" by astronomer Paul W. Merrill (<http://www.paccd.cc.ca.us/ps2/poorwrt.htm>), reprinted from *Suggestions to Critics*, United States Geological Survey.

¹⁰ Some theorists wantonly combine metaphors of this kind. Douglas Mueller, for example, writes: "A polysyllable malady infects most business writing. Long woolly words do to business prose what rolls of fat do to a girl in a bikini" [19, p. 174].

¹¹ Lanham uses the "lard" metaphor throughout *Revising Business Prose*, 3rd Edition [20].

- Fatty phrases: *due to the fact that, prior to, work project, contracting party, at that point in time.*
- Pure fat (unnecessary repetitions): *charge or cost, null and void*

Trimming fat would produce something like this:

Since the compressor broke down before we finished the job, we told the contractor to bring us another one, at no extra cost, or we'd cancel our contract with him.

Plenty of handbooks display long lists of fatty words and phrases: "aggregate" for sum, "approximately" for about, "optimum" for best, "in the vicinity of" for near, "owing to the fact that" for because, "subsequent to the start of" for after, and so on. Clearly, one improves the style of professional communication by trimming such fat. Of course, I say "clearly" the way a rhetorician does when he wants his audience to accept his argument and let him move on. My own students don't usually let me move on so quickly, because so many of them have been taught that fat enhances dignity or officialness or professionalism. Such conceptions hurt them. As Mark Twain may have said: "It ain't the things we don't know that hurt us; it's the things we do know, but ain't so." So much then for fatty writing. It's nearly always bad. But we should not confuse fat with jargon. Jargon is a different creature, and although it is often misused, it also plays a legitimate—indeed, a vital—role in scientific and technical communication.

Quiller-Couch, though, does call this kind of language jargon, and he ends his own lecture on this topic by reflecting on the mental and moral consequences of preferring jargon to straight talk:

If your language be Jargon, your intellect, if not your whole character, will almost certainly correspond. Where your mind should go straight, it will dodge: the difficulties it should approach with a fair front and grip with a firm hand it will be seeking to evade or circumvent. For the Style is the Man, and where a man's treasure is there his heart, and his brain, and his writing, will be also [17, p. 103].

By Quiller-Couch's definition, accusing a scientist or anyone else of using jargon, especially of using it habitually, is very insulting indeed.

Writing several decades after Quiller-Couch, and well aware of that professor's contributions to stylistic theory, Sir Ernest Gowers produced his *Plain Words: Their ABC*. Gower's sense of the word "jargon" is also negative, but different from Quiller-Couch's. Gower lamented that the dictionary definition¹² of jargon—"a

¹² This definition, we infer from Gowers, had been the most prevalent one in England in his day (or leading up to his day)—and indeed, the corresponding O.E.D. definition of "jargon" reads: "Applied contemptuously to any mode of speech abounding in unfamiliar terms, or peculiar to a particular set of persons, as the language of scholars or philosophers, the terminology of a science or art, or the cant of a class, sect, trade, or profession" [6, p. 1502].

word applied contemptuously to the language of scholars, the terminology of science or art, or the cant of a class, sect, trade, or profession"—was in his day being "handled promiscuously" and was losing its edge. It had come to mean "any speech that a person feels to be inferior to his own" [21, p. 116]. Gower actually classified the specialized language of science in this category and considered much of it to be part of the "new Tower of Babel" that was confusing the communication of humanity [21, p. 117]. However, Gower mostly used the term jargon to describe "official writing," and here we see most clearly the distinction he had in mind:

When officials are accused of writing jargon, what is generally meant is that they affect a pompous and flabby verbosity. That is not what I mean. What I have in mind is that technical terms are used—especially conventional phrases invented by a Government department—which are understood inside the department but are unintelligible to outsiders. That is true jargon [21, p. 117].

We sometimes use the word jargon in that sense today, though we may be more specific and call it "bureaucratese," "Pentagonese," or some such. It is a mixture of technical terms, words used in a special sense, and acronyms. "For those outside," writes Ros Coward in an article about the language of the United Nations bureaucracy, "the language is bizarre and excluding . . . Inward-looking jargon brings serious problems. . . . Acronyms and jargon are not just difficult to understand but are alienating, taking the issues out of the hands of those who are most active in them and most actively affected by them" [22, p. 2].

In this sense, Gower's definition of "true jargon" points an accusing finger at the sciences, too. Consider ecoscience's specialized use of words like "biodiversity, ecosystem, stability, productivity, pioneer, exploitation, carrying capacity, and sustainability." Dean Adams et al. looked at the usage of such words in 43 professional journals with five distinct audiences (ecologists, students, biologists, other scientists, and the general public) and found considerable confusion [23, pp. 632-635]. "Many jargon words used in ecology sound appealingly like everyday words . . . [but] the stakes for misunderstanding of terms and metaphors are large, as these errors may impact directly upon the creation of laws and policies that affect the future of ecosystems" [23, p. 635]. This kind of jargon, according to Adams et al.,¹³ creates confusion among laypersons and scientists alike.

But should we, along with Gowers, confine our definition of jargon to this kind of terminological confusion, or to a communicator's impulse toward exclusivity? Should this be our definition of "true jargon"? Why not call such usage *bad* jargon? Then, as I continue to argue, we can preserve at least the neutral sense of "jargon" simply to indicate the specialized vocabulary of science and technology

¹³ Adams and his colleagues are not alone in pointing out this distressing variety of jargon. See, for example, the introduction to W. E. Flood's *Scientific Words: Their Structure and Meaning* [24].

(when context shows we mean this kind of jargon as opposed to any other specialized vocabulary). There is absolutely nothing wrong with specialized vocabulary. Science and technology would be crippled without it.

This doesn't mean, of course, that scientists always use this feature of language well, nor that they all just love it when fellow scientists fill communications with specialized terms. For the most part, good use of jargon requires the same kinds of judicious choices that make for good communication in general—for example, choices that make comprehension as accurate, swift, and easy as possible.

BAD JARGON AND GOOD

Let's first consider the senses in which jargon can be bad; later we'll move on to describe good jargon. Jargon is certainly bad when it is used improperly; it is also inherently bad when the borrowing or transliteration or coining of a term is bad. Both these senses of bad refer to functional badness, not moral badness—but Sir Quiller-Couch's observation about the effect of style on character should not be forgotten.

Jargon is Bad When Badly Used

The second epigraph you glanced at before diving into my article is a quotation from *A Guide to Technical Writing* by T. A. Rickard [25], a geologist, mining engineer, teacher, lecturer, and author of several books about good scientific and technical writing. The last chapter of his *Guide* is "A Plea for Greater Simplicity in the Language of Science," the essence of which is akin to the Fowlers's famous bit of advice: "Prefer the short word to the long; Prefer the Saxon word to the Romance" [26, p. 11]. Rickard's plea is particularly interesting because it comes from a scientist/engineer, someone well able to handle the technical terminology of his field. Among other thinkers, Rickard quotes Huxley, who said that if a man really knows his subject, "he will be able to speak of it in an easy language and with the completeness of conviction with which he talks of an ordinary every-day matter. If he does not, he will be afraid to wander beyond the limits of the technical phraseology which he has got up" [25, p. 118].

Perhaps we can regard such statements as pertinent to philosophical exchanges about science, but not pertinent to everyday, practical exchanges about science? We could indeed make an argument in this direction, but Rickard, and probably Huxley, might oppose us, or at least insist that we qualify our position. Rickard uses ridicule to drive home his point about scientists and engineers who use unnecessary, inflated, Latinate language:

A mining engineer, of the kind known to the press as an expert, described a famous lode as traversing "on the one hand a feldspathic tufaceous rock" and "on the other hand a metamorphic matrix of a somewhat argillo-arenaceous composition." This is scientific nonsense, the mere travesty of speech . . . his

description, when translated, means literally a changed matter of a somewhat clayey-sandy composition, which, in Anglo-Saxon, is m-u-d! [25, p. 121].

The engineer whom Rickard quotes was, presumably, speaking to the press, not to fellow experts, so audience adaptation is an issue here—yet the quotation illustrates pretty well what I mean by “bad jargon”: specialized vocabulary, usually heavily Latinate, used excessively, unnecessarily—perhaps for show, perhaps because the speaker or writer is lazy or rude. Rickard goes on to describe such language as “metamorphosed English pseudo-morphic after blatherumskite”; he then transitions into a distinctly sermonic tone, condemning “the practice of distributing, not good wholesome intellectual bread, but the mere stones of knowledge, the hard fossils of what were once stimulating thoughts” [25, p. 122].

Are these stones the inescapable food that scientists and technicians must digest? Rickard suggests otherwise, though he insists that he is certainly not “attacking all technical terms.” He recognizes the legitimate use of the specialized vocabulary of geologic and other sciences. Still, he refers to those technical terms that must be used as “a necessary evil” [25, p. 116].

Some might say that Scientist Rickard was writing in a philosophical, not a practical vein (no pun intended), and also that he was writing a century ago, that his concerns run backwards to Thomas Sprat and earlier, but not forward to our day, when the demands on the vocabulary of science are much greater.

Sprat, the historian and rhetorically savvy advocate of The Royal Society of London, published his *History* in 1667. Here is his oft-quoted passage about the writing style of his honored Society friends:

They have . . . a constant Resolution, to reject all the amplifications, digressions, and swellings of style: to return back to the primitive purity, and shortness, when men deliver'd so many *things*, almost in an equal number of *words*. They have exacted from all their members, a close, naked, natural way of speaking; positive expressions; clear senses; a native easiness: bringing all things as near the Mathematical plainness, as they can: and preferring the language of Artizans, Countrymen, and Merchants, before that, of Wits, or Scholars [27, p. 113].

As Jackson Cope and Harold Jones point out in their introduction to Sprat's history, Sprat was writing not long after a civil war in England, a war he knew had been much inflamed by the “passionate” and “fantastical” language used by orators and writers of various stripes (especially religious ones). Sprat hoped that a dispassionate, empirically grounded, universal, “mathematical” language would help men work together in enlightened, lasting peace. He wanted a clear separation between language used to explore and describe Nature, something all men should be able to agree upon and work with harmoniously—and the swellings, partisan passions, and shifting “colours of Rhetorick” [27, p. 62].

Cope and Jones observe that Sprat himself was not a scientist; he was an able rhetorician who used his skill with words to promote the philosophies and purposes of the Royal Society. But I think we can grant that Sprat avoided, even in his own writing, the fantastical, the (unduly) passionate, the deceitful, the too-colourful, and most of the other *ugly* conditions of Rhetorick.

So, do no scientists now feel as Rickard did? Anecdotal evidence, at least, suggests that scientists themselves are sometimes grateful when they are not required to wrestle with technical vocabulary. For example, a Canadian scientist by the name of Terry Pearson, reacting to a parliamentary law requiring plain English summaries of scientific projects receiving government grants, was grateful for the "easy-to-read summaries [that] will not only inform taxpayers, but also help him understand projects outside his field. 'Real science in straight English,' he says. 'I love it'" [28, p. 1372]. My friend Dr. James Herrick, a microbiology professor at James Madison University, says much the same thing: he loves real science in the straightest talk possible.

Of course, Pearson's comment about science "outside his field" is a telling remark; it's a statement relevant to audience adaptation. Perhaps that's all any scientist or professional need be concerned about: *who* will be reading his/her prose, and for what reasons? Certainly, jargon is bad when ill adapted to its audience. But as Dr. Rickard pointed out, jargon is also bad whenever it is excessive—that is, when it is unnecessary. And as Dr. Pearson confirms, even scientists prefer straight talk when they can get it.

Jargon is Bad When Ill Formed

The preceding subsection argued that jargon is bad when badly used (unnecessary, excessive, or ill adapted to its audience); that's probably the most obvious kind of jargon badness. Less obvious, perhaps, is the fact that jargon can also be bad functionally, in and of itself, when it is badly borrowed, transliterated, or coined. We now turn our attention to this latter category of badness: bad formation, invention, or metaphorical application of scientific terms.

The jargon of science and technology is not static; it grows daily around the world as (for example) new plants, animals, microbes, scientific tools, medical procedures, and drugs are discovered or invented. In fact, the vocabulary of science has swollen to gargantuan proportions since the 17th century, when Sprat enunciated his famous injunction against the "amplifications, digressions, and swellings of [ornate or emotional] style" [27, p. 113]. Scientific language may have shed some of its rhetorical poundage post Sprat,¹⁴ but if Sprat hoped that achieving a near one-to-one correspondence between words and things

¹⁴Not an entirely good thing, as Merrill Whitburn rightly argues in "The Plain Style in Scientific and Technical Writing" [29]. Sprat, for all his noble intentions, helped throw out the baby of good rhetoric with the bathwater of bad rhetoric.

would keep the vocabulary of science from swelling, he was mistaken. He could not have foreseen how many *things* science would deal with as it marched toward further enlightenment. Whether or not his call for "primitive purity" and "native easiness" in scientific language was an attempt to control the unnecessary use of Latin- and Greek-based terminology is a subject I won't pursue here in relation to Sprat, but clearly, that terminology has been dominant and continues to swell.

This swelling has created a problem, since scientists are unequal as namers of things. That is why the various sciences have their official bodies and committees (their best namers) attempting to oversee the question of "good versus bad" jargon for their respective fields. The jargon rules for each major branch of science are spelled out in the various Codes of Nomenclature and Approved Lists of Nomenclature for the sciences; these are supplemented (and sometimes challenged) in numerous books, articles, bulletins, and conference presentations by classicists, scientists, and scholars of various stripes. Does this mean that all scientists dutifully follow the nomenclatural rules laid down by their societies? Well, if it did, there would be no need for publications like *Official Index of Rejected and Invalid Family-Group Names* [30] (and of *Generic Names* [31], *Specific Names* [32], *Works* [33], etc.).¹⁵

Although the various branches of science and the professions do have peculiar nomenclatural requirements—for example, although biological research has many concerns, it is particularly noted for its concern with "genus-species" terminology and the differentiation of creatures of all kinds, both plant and animal, whereas medicine is particularly concerned with "causes, processes, procedures, and effects" [34, p. 15]—all fields, generally speaking, wish to use terminology that is as precise and restrained as possible. The various fields also (usually) wish to cooperate with each other as much as possible so as to avoid confusion among professionals. When terminology violates any of these (and other) guidelines, it begins to slip into that broad category I'm calling inherently bad jargon.

My article would become uncontrollably long were I to detail the many varieties of bad jargon as developed in these codes of nomenclature and their scholarly supplements; for my purposes, it's enough simply to list some of the kinds of badness these treatises discuss and to provide a few examples for illustration. I note at the outset that opinion on these matters is not universal; indeed, the

¹⁵Proposed names for living things (or non-living ones, such as viruses) can be rejected for various reasons lying outside the question of good or bad jargon. For example: if a researcher, eager for first rights to name something, does not publish an acceptable description along with the new name he proposes, a committee may at length reject the name as a *nomen nudum*, a "naked name," until such time as the proposer comes out with an acceptable accompanying description (if ever). Or it may simply be a question of priority (previous *acceptable* description and naming of the same organism or phenomenon by someone else). However, many names do get rejected on the basis of "ill-formed jargon" as described in this section of my essay.

very Codes of Nomenclature differ on some points.¹⁶ However, most scientists, linguists, and systematists¹⁷ agree that scientific names should be as regular, helpful, precise (but restrained), and euphonic as possible.

So—jargon can be bad if:

1. *It is malformed* (linguistically incorrect). This can be due to faulty transliteration from the Greek and/or Latin, creation of false stems, incorrect addition/deletion of various letters, and a whole range of mistakes that horrify word lovers.
2. *It is a misnomer*. It does not well fit, either literally or metaphorically, the phenomenon it attempts to describe. For example, “bradydactylia” literally means slow finger, which is a bad term for describing a *short* finger. The term results from a confusion of “bradus,” slow, with “braxus,” short [34, pp. 271-272].
3. *It is unrestrained* (too long, inconvenient): “Pneumoultramicroscopicosilicovolcanokoniosis,” “hepaticocholangiocholecystenterostomy.” Here the payoff must be between precision and restraint [34, p. 16].
4. *It is a hybrid term*. I refer here to linguistic, not botanical, hybridization. Most organizations prefer that new formations be purebred (Latin) rather than hybrid (Latin and Greek, usually).¹⁸ Nybakken points out that the very word “hybrid” comes from “hybris” (Grk.), “meaning insolence or outrage, and persons who dislike the use of hybrid terms regard the construction and use of such terms as an insolent and outrageous defiance of sound linguistic practice” [34, p. 274]. Nybakken is especially outraged when a hybridization is both “undesirable and unnecessary”—that is, “when it results in producing a word that is a synonym of a familiar and satisfactory purebred word.” He gives the example of the scientific names for the ankle bone (“astragalos” is the Greek word in the following constructions, “talus” the Latin): “Since the purebred terms, ‘talocalcaneal,’ ‘talocrural,’ and ‘talotibial’ are commonly used for designating the relationship to the ankle bone and adjacent structures, there seems little need for the hybrid synonyms ‘astragalocalcaneal,’ ‘astragalocrural,’ and ‘astragalotibial’” [34, p. 275].

¹⁶ For example, in use of tautonyms (genus and species names being exactly the same, as in “*Bison bison*”). The Botanical and Bacteriological Codes reject tautonyms; the Zoological Code allows them [35, p. 23].

¹⁷ “The refinement of [the] process of recognition and grouping into the scientific study of the diversity of living organisms has given rise to a branch of biology known as systematics. The task of systematics is to produce systems of classification which best express the various degrees of overall similarity between living organisms. Such systems are used in biology for the storage, retrieval and communication of information and for the making of reliable predictions and generalizations” [35, p. 1].

¹⁸ The Fowler brothers, authors of the oft-quoted *The King’s English*, allowed the rule to be broken for “the intricate needs of science,” but they did hold to the general rule: “It is at least desirable that in making new words the two languages should not be mixed” [26, pp. 50-51].

5. *It is an eponym*, that is, the name of a person associated with something, such as the discoverer of an animal, or the original describer of an anatomical structure or disease, or even a famous sufferer of a disease, as in "Lou Gehrig's Disease."¹⁹ Hundreds of eponyms are still holding strong in both popular and scientific literature, but the Codes forbid, or at least strongly discourage, the coinage of further eponyms. Further, they encourage the use of descriptive terms rather than even the "accepted" eponyms; "uterine tube" is better jargon than "Fallopian tube," for example. This movement against eponyms extends even to the naming of new flora and fauna, but here opinion is mixed. What would obedience to such a rule have done to that delightful movie *A New Leaf*, starring Walter Matthau? (Matthau becomes a dedicated husband rather than a wife-killer in part because he is touched by his botanist wife's naming of a new plant for him.)
6. *It is used in a special sense*, and then not used consistently in that special sense even among the experts themselves. Recall my earlier reference to words like "biodiversity, ecosystem, stability, productivity, pioneer, exploitation, carrying capacity, sustainability" as discussed by Adams et al. [23].
7. *It is very difficult to pronounce*: "syzygy," "psittacistic." Many "unrestrained" terms also fall into this category.
8. *It is a forgotten name*, a "*nomen oblitum*," one that has been out of general use for a half century or more.

This is just a partial list of "badly formed" jargon; I could go on to list and describe names that are superfluous, ambiguous, confused, dubious, in conflict (as for example fossil taxa competing with recent taxa), and possessed of many more problems [35, pp. 21-25]. And we haven't even begun to list the various kinds of bad coinages that stand outside these official rules of nomenclature. For example, jargon can also be bad if it causes unnecessary alarm. That is why the safe, non-invasive technique for mapping the inner parts of the body that was at first called "nuclear magnetic resonance" (NMR) was later changed to "magnetic resonance imaging" (MRI). The public's fear of things "nuclear," tantamount in many minds to "radioactive," was not warranted in the case of this new technology. So "nuclear" was dropped and "magnetic," a word with better associations, was legitimately foregrounded, while "imaging" (a further improvement) was added.

Another example of bad coinage would be offensive jargon, as in the military jargon word "snafu" (an acronym for Situation Normal All F _ _ ed Up), a term that, I can imagine, systematists of scientific jargon are tempted to use from time to time.

All these kinds of mistakes, bad usage, and bad coinage constitute something we should call "bad jargon." Now let's look at the legitimate, helpful, and necessary use of specialized scientific/technical vocabulary: good jargon.

¹⁹ Amyotrophic Lateral Sclerosis (ALS).

GOOD, LATINATE JARGON

Good jargon is just the reverse of bad: it is well formed and well used.

Well-Formed Jargon

"Streptococcus" may be a nasty little bacterium, but the word itself is a piece of good jargon. Strept- (Gk.) means twisted, o is the sonorous combining vowel (for ease of pronunciation), and cocc- (Gk.) means berry. The two Greek words do not form a hybrid,²⁰ they are well transliterated and combined, the resulting term is not too long or difficult to pronounce, and the endings of the resulting word are properly Latinized. Also, streptococci (plural) do look a lot like twisted strings and clumps of berries (on a small scale). That's a good visual correspondence; it connects with something we've all seen or can easily visualize. All this adds up to good jargon.

There are many thousands of such examples. The point of debate in many minds is this: if the little critters look like twisted strings/clumps of berries, why don't microbiologists (studiers of tiny life forms) just call them the "twisted berry critters"?²¹

Some people would actually prefer "twisted berry critters" to "streptococci," just as Dr. Rickard preferred "sandy-clayey" to "argillo-arenaceous." They dislike the dominance of Latinate terminology in the professions. Can't we let good old Anglo-Saxon do the yeoman's task of jargon work, or at least do a lot more of it? Many (British and American) stylists over the centuries have argued something like this, but they have never been successful in breaking up the marriage of Latin and Science. The special knowledge, special investigations, special duties and demands of science and technology (not to mention law, philosophy, and so on) are married to a special vocabulary into which they have for centuries poured their wisdom. It has been a fruitful relationship, and it looks to be permanent.

Another category of jargon we must acknowledge as well formed is that of good acronyms, abbreviations, numerical designations, and all the various symbols used to communicate scientific information—so long as they really do enhance precision and speed of communication among specialists. For example, if scientists use the acronym "SEM" for "scanning electron microscope," it's really just a condensation of a phrase that is already a good, descriptive piece of jargon. If "SEM" registers in their minds with equal accuracy but greater speed, then it is excellent jargon. If scientists later figure out a way to communicate among themselves via mental telepathy, that is better yet—other things (such as moral rectitude and public accountability) being equal.

²⁰ Again: there are plenty of hybrid terms in the vocabulary of science, but purebreds are preferable.

²¹ Alternatively, twisted berry varminits.

Well-Used Jargon

Even jargon carrying the goodness of being well formed descends into badness if ill used. Clearly, it is ill used when ill adapted to the understanding of its audience or to the context (the occasion or exigency) in which it is used. Conversely, it is well used when well adapted to those things and when it achieves its goals of precision, speed, universality, and so on.

Here are two passages full of the jargon used by particle physicists. They contain Latinate language, common words used in a special sense, and allusions to bodies of knowledge commonly understood in the discipline of particle physics. Is there any reason why these scientists should not use such jargon when communicating with each other?

We first explore the Feynman-Wheeler form for electrodynamics and show that helical solutions exist. Then we consider causal electrodynamics and calculate the azimuthal force, which causes the motion to be nonhelical. The radial force for helical motion in this case is the same as for the Feynman-Wheeler interaction [36, p. 66].

The helical solutions that we have found may behave when perturbed in some ways like relativistic strings when their velocity tends to infinity. A circular motion will map out a helix in space-time and, if the velocity of the tachyon is very high, then the pitch of the helix will be small, and the tachyon's world-line will look like a cylindrical surface. Its mechanical behavior may begin to resemble that of a relativistic string in this limit [36, p. 73].

These passages rely on a base of knowledge assumed to be shared with the reader, and they then make a contribution to the conversation (among particle physicists) about the motion of tachyons. If such authors could not assume that base of knowledge, if they could not use the condensed jargon of their field, their articles would wax very long indeed, and the trajectory of the science of particle physics would be seriously perturbed.

Here's another example of scientific jargon, this time from T. A. Rickard's field of study, mineral science:

Mineralogical characterization of microbial ferrihydrite and schwertmannite, and non-biogenic Al-sulfate precipitates from acid mine drainage in the Donghae mine area, Korea [37, p. 19].

This article title is just the crust lying over even denser layers of jargon. Rickard would no doubt read the article with a grim sense of "necessary evil." The "necessary" part of this term we understand; the professions absolutely do need their special vocabularies. To what does the "evil" in Rickard's expression refer? Specifically, to the dominance of Latinized jargon in the vocabulary of science and technology.

Latinate Jargon

Many teachers of composition, especially those on a knight's errand against jargon as they define it, are familiar with the famous advice of H. W. and F. G. Fowler that good style will "prefer the Saxon word to the Romance." But that is often quoted out of context; the Fowlers carefully qualify their rule.

Here is the Fowlers's short list of rules for good style:

- Prefer the familiar word to the far-fetched
- Prefer the concrete word to the abstract
- Prefer the single word to the circumlocution
- Prefer the short word to the long
- Prefer the Saxon word to the Romance [26, p. 11]

That last rule, they acknowledged, was "also the least"; it was really just a "compendium" of the others, because in general, if one keeps her words familiar, concrete, direct, and short, she ends up using a preponderance of Anglo-Saxon words *naturally*. To do otherwise, said the Fowlers, was to take pains that would be "worse than wasted." After all, English is irreversibly a hybrid language, and as the Fowlers said, it's English we want to learn to use well, not Saxon. Their discussion of style does not focus on scientific style, by the way, and in a footnote to their rules that confirms their inclusion of Greek borrowings under the term "Romance," they note: "The vast number of purely scientific Greek words, as oxygen, meningitis, are on a different footing, since they are usually the only words for what they denote" [26, p. 11].

Gowers points out that Quiller-Couch criticized the Fowlers's rule about preferring the Saxon word to the Romance (though I must conclude that Quiller-Couch was really criticizing the use other people were making of the Fowlers's well-qualified fifth rule) and he quotes Bradley on the subject:

The cry for "Saxon English" sometimes means nothing more than a demand for plain and unaffected diction, and a condemnation of idle taste for "words of learned length and thundering sound" which has prevailed at some periods of our literature. So far it is worthy of all respect; but the pedantry that would bid us reject the word fittest for our purpose because it is not of native origin ought to be strenuously resisted [21, p. 85].

Gowers goes on to say that "What we are concerned with is not a quest for a literary style as an end in itself, but to study how best to convey our meaning without ambiguity and without giving unnecessary trouble to our readers" [21, p. 85]. Those are the most important goals of scientific communication, too—or they should be. And defenders of scientific jargon argue that it is precisely because they want to be unambiguous and give their own colleagues as little trouble as possible that they freely use the highly Latinate/Latinized vocabulary of science and technology.

This vocabulary comes to English ("Anglish," the language of the Anglo-Saxons) primarily through its infusion from Latin and its embedded Greek linguistic heritage. Of course, thousands of the modern English speaker's "everyday" terms derive from Latin/Greek, but thousands more are the deliberate appropriations and constructions of specialists.

Medicine, pharmacology, dentistry, zoology, botany, physics, chemistry, and every other science, makes extensive use of Latinized vocabulary,²² the most extensive category of jargon. Aware of the common prejudice against the linguistic features of scientific and technical vocabulary, many authors of books²³ designed for students entering scientific/technical fields contain well-developed arguments for the value of such vocabulary. Although treatments of jargon in the literature of technical communication and rhetoric tend to focus on bad jargon, even in these publications we sometimes see a treatment of good jargon, an explanation about and defense of the specialized terminology of science and technology.²⁴

Here are the major arguments in defense of good jargon that are advanced in such books and articles. Again, space will not allow me to expand upon these categories, but listing them is sufficient for my purposes here.

Scientific jargon is good because:

1. *It is economical* (condenses complex ideas into few words).
2. *It is precise* (uses Latinate vocabulary to name things not accurately named, or not named at all, in common speech).
3. *It is stable* (not much influenced by vernacular, fickle cultural changes, language shifts).
4. *It is flexible* (Greek and Latin are excellent sources for synthetic vocabulary).
5. *It is nearly universal* (because of the dominance of Latin and Greek, passages of jargon-filled scientific prose are largely intelligible to fellow scientists around the world even if they are not familiar with the primary language of the writer).
6. *It enhances cohesion among the sciences* (this is, at least, a goal put forward by various Codes.)
7. *It connects us with previous scientific thought* (Greek and Latin scientists and subsequent thinkers using Latin/Greek in their treatises).
8. *It allows for a kind of secrecy and for decency* (for example, doctors can confer in the hearing of patients and relatives/friends of patients without being understood; doctors can refer to various body parts and functions without sounding crude).

²²"Scientific terminology is nearly one hundred per cent Latin or Latinized Greek" [38, p. 1].

²³See Nybakken [34], Flood [24], Mandell [39], Savory [40], and Hough [38].

²⁴See Wilkinson [1], for example.

This last point is a can of worms, but let's keep the lid on for now. I'm going to assume ethical, compassionate, intelligent doctors/scientists and proceed to my general statement: Whenever specialists use well-formed jargon, among themselves, in ways that achieve the goals of economy, precision, stability, cooperation among colleagues, and so on, they are using good jargon. I encourage you, my reader, to use the same expression. Such use of language should be praised, not blamed.

There is, however, a major proviso we must consider—a possible reason why even specialists, communicating among themselves, might do well to *reduce* (not eliminate) their level of jargon—so long as they preserve the necessary level of precision as well as other desired rhetorical features.

A PROVISIO: CONSERVING MENTAL ENERGY

Precision and speed are arguably the greatest desiderata of scientific communication, especially when experts communicate with each other. Think of the jargon terms that experts have learned as “counters,” game pieces in an elaborate mental game. Those experts have studied hard to learn the meanings of the various counters. Normally, they need not any longer explain at length to each other what “tachyon” or “stochastic” or “quantum-mechanical” means; they can now let these terms stand for certain complex concepts and push them rapidly about on the mental game board as they explore in many directions, try new combinations, share their discoveries with each other, and work with each other. And when it comes time for a rapid and precise *performance* of some kind—say, performing surgery, or using complex equipment to run a scientific experiment on deadly substances—familiarity with and good use of jargon terms becomes absolutely essential, even a matter of life and death.

There's not much counter argument to the position that scientific and technical communication must be precise. But the debate continues about what specific features of scientific and technical style really do make for economy. And since the need for precision is pretty much a given, that point tends to collapse into the point about economy: What words really are best at achieving precision *while giving the least trouble to readers*—to all kinds of readers, even to expert readers? There's the core of the matter, and of course when we begin to unpack it, we find ourselves deep in discussion about audience adaptation and rhetorical effectiveness. But the mark of the topic's complexity is that we find ourselves still debating about jargon even as used among experts.

Brand Blanshard, whose book *On Philosophical Style* inveighs against the excesses of jargon committed by many philosophical writers, makes the following “aside” in a reference to writing in other fields:

I do not know why a biologist, presenting a paper on a technical point to colleagues, should not write in a way as unintelligible as he pleases to those outside the circle, provided it is no obstacle to those inside [41, p. 9].

But there are those who say such writing does provide an obstacle to those inside, and that therefore biologists and other scientists and technicians should not write that way. The most compelling argument in this direction comes from an old scientist, engineer, philosopher, economist, sociologist—and dare we add rhetorician?—by the name of Herbert Spencer (1820-1903).

Spencer's Caution about Jargon

Most people best know Spencer for his treatises developing a comprehensive theory of evolution as manifest in the physical universe and in human development (physical, cognitive, and social). It was Spencer who coined the phrase "survival of the fittest," and he has been rightly criticized for the pernicious social effects of his ideas about genetic and social evolution. But passing over those criticisms, let us consider, in isolation, one of his seminal essays: *The Philosophy of Style*.²⁵ This essay has had an important influence in subsequent thought about linguistics, cognitive psychology, psycholinguistics, rhetoric, and composition (including what we call "readability studies").

Spencer's essay deserves a much lengthier treatment than I can give it here.²⁶ For my current purposes, I will simply summarize the central concept in Spencer's essay, conservation of mental energy, and discuss its importance as a counterbalance to arguments about the economizing virtue of jargon.

Spencer compares the symbol processing done by the human mind to the mechanical work done by a machine, reasoning that in the cases of both mind and machine, "the more simple and the better arranged its parts, the greater will be the effect produced." In both cases, the energy required to run the device (mind or machine) must be "deducted from the result." Hence he arrives at the formula that the more mental energy we must expend in understanding the form of a communication, the less energy we have to devote to its substance, and conversely, the less mental energy we need expend in understanding the form of a communication, the more energy we have available to devote to its substance. In Spencer's words:

A reader or listener has at each moment but a limited amount of mental power available. To recognize and interpret the symbols presented to him, requires part of this power; to arrange and combine the images suggested by them requires a further part; and only that part which remains can be used for framing the thought expressed. Hence, the more time and attention it takes to receive and understand each sentence, the less time and attention

²⁵Originally "The Force of Expression," (1852); Spencer wrote it as a young man.

²⁶For excellent analyses of Spencer's essay, see essays by George Denton [42, 43].

can be given to the contained idea; and the less vividly will that idea be conceived [44, p. 335].

For Spencer, who suffered from intense headaches and "cerebral pressure," prose that conserved the reader's mental energy was much to be desired. Of course, we all desire it. Every scientist, technician, manager, and professional of every kind wants the greatest mental benefit for the least mental effort. Spencer's approach to style was based on the notion that the mind has a limited (but of course renewable) amount of energy that supports the activity of its various "organs" (attention, ratiocination, imagination, and so on). That part of the mind tasked with interpreting linguistic symbols was required to labor harder than need be when the symbols were longer, less familiar, or sequenced in more difficult patterns than need be. Conversely, the mind expended less energy and moved faster when symbols—both individual words and their arrangement—were as short and familiar as possible.

I must pass over, as falling outside the focus of my essay, the fascinating implications of Spencer's theory of efficient syntax; for a readable, modern treatment of the subject that includes a profound debt to Spencer, see E. D. Hirsch's *The Theory of Composition* [45]. I must also pass over Spencer's observations about use of simile and metaphor, of rhythm, and other topics in style. But the application of Spencer's stylistic theory to use of the long, Latinate jargon words so common in scientific and technical communication is immediately apparent. Such words are generally longer than their Anglo-Saxon equivalents (when such equivalents exist), and they are less familiar. That is, they are not the words we learn in our early youth. According to Spencer, the neural pathways that recognize and process words become "hard wired"²⁷ to their earliest associations, which, for native English speakers, are forged primarily between Anglo-Saxon words and the ideas they represent. Thus, according to Spencer, a general reference to "water beetles" (my example) will always process more efficiently (exhausting less mental energy) than "*Coleoptera hydrophiloidea*,"²⁸ even if the child grows up to be an entomologist and uses the Latinate words frequently. Here is Spencer's own explanation of the phenomenon:

²⁷ My metaphor/cliché, not Spencer's.

²⁸ "*Coleoptera hydrophiloidea*" is still what I've been calling good jargon; it translates nicely to "sheath-winged water lovers," it obeys the nomenclatural rules laid down by biology, and it has all the other features of good jargon, including even good sound. But Spencer's point is precisely in this notion of "translation," the extra mental effort that the brains of native English speakers must exert when hearing or reading a phrase like *Coleoptera hydrophiloidea*. His advice would be to go with "water beetles" unless the Latin designation were really needed. Of course, *Coleoptera hydrophiloidea* expresses just an order and superfamily; more often, an entomologist or other scientist wants to refer to classifications further down the Linnean line, probably to a particular genus and species of beetle, or even to a subgenus, section, subsection, series, subseries, subspecies, variety, subvariety, form, and subform! If so, there's no avoiding the Latin—unless a common name or other simpler designation is available and will serve. Then the scientist faces a rhetorical choice.

A child's vocabulary is almost wholly Saxon. He says, *I have*, not *I possess*—*I wish*, not *I desire*; he does not *reflect*, he *thinks*, he does not beg for *amusement*, but for *play*; he calls things *nice* or *nasty*, not *pleasant* or *disagreeable*. The synonyms learned in after years, never become so closely, so organically, connected with the ideas signified, as do these original words used in childhood; the association remains less strong [44, p. 336].

Spencer admits that synonyms (if they really are strictly synonyms) call up the same images in the mind of the reader, but for the native English speaker/reader, the Saxon word will always do it faster and with greater force than the Latinate one. The Latinate word, having been learned later in life, "has not been so often followed by the ideal sensation symbolized," and therefore "does not so readily arouse that ideal sensation" [44, p. 336]. This notion of ideal sensations and the clearness, speed, and vivacity of impressions delivered by words is expressed one way or another in all the books Spencer read (or skimmed) before writing his essay; it is especially reminiscent of George Campbell's *The Philosophy of Rhetoric*.²⁹

Another reason Saxon words are better conservators of mental energy is that they are generally shorter than Latinate words. Spencer refers to the "cumulative fatigue" that registers in the mind as we read or listen, and he reasons that "If it be an advantage to express an idea in the smallest number of words³⁰, then it must be an advantage to express it in the smallest number of syllables" [44, p. 337]. Fewer bits of data, faster and easier processing.

There are many objections to Spencer's ideas about style,³¹ and I must pass over them all as I near the end of my article. But Spencer has expressed an important idea that should counterbalance our thinking about the virtues of jargon. Yes, economy is desirable, and there is a sense in which scientific jargon is all about economy. But Spencer's theory reminds us that precision of expression achieved by the special meaning packed into the Latinate vocabulary of science and technology is not the only road to economy. Indeed, opines Spencer, that very vocabulary may sometimes be more exhaustive of mental energy than necessary. That is, it may unduly tax the cognitive processing people go through as they read or hear scientific jargon.

I'm reasonably sure that Spencer would agree with all three of Gowers's rules for good style:

²⁹ It is challenging to assess the true extent of the debt Spencer owed to George Campbell, Richard Whately, Hugh Blair, Lord Kaimes, and Robert Latham, the rhetoricians whom (presumably) he perused before/while writing "The Philosophy of Style." See Denton's "Herbert Spencer and the Rhetoricians" [42].

³⁰ Compare Campbell: "... the fewer the words are, provided neither propriety nor perspicuity be violated, the expression is always the more vivid. ... the more briefly it is expressed, the energy is the greater, or the sentiment is the more enlivened, and the particular quality for which it is eminent the more displayed" [46, p. 333].

³¹ See for example Travis Merritt [47, pp. 15-20] and Ralph Renwick [48].

Use no more words than are necessary to express your meaning, for if you use more you are likely to obscure it and to tire your reader. In particular do not use superfluous adjectives and adverbs and do not use roundabout phrases where single words would serve.

Use familiar words rather than the far-fetched, if they express your meaning equally well; for the familiar are more likely to be readily understood.

Use words with a precise meaning rather than those that are vague, for they will obviously serve better to make your meaning clear; and in particular prefer concrete words to abstract, for they are more likely to have a precise meaning [21, pp. 85-86].

The question remains about what level of familiarity really is attained by native English speakers who hear and write Latinate jargon daily. I can imagine an entomologist testifying that for her, "*Coleoptera hydrophiloidea*" really does bring up images of water beetles more quickly and vividly than "water beetles" does. I don't know how that could be verified, though perhaps a cognitive scientist does.³² But without doubt, Spencer and Gower agree that good style is that which gives the reader the least trouble. That is, the least *possible* trouble given the demands of the subject matter and the psychological (rhetorical) effect one aims for. This is what Spencer means by the phrase he repeats throughout his essay, "other things equal."

CONCLUSION

A friend of mine, a highway engineer, once told me something about the process of placing explosives in rock formations and laying out the charge lines that carry electricity to the detonators attached to the main charges. The charge lines, he said, one lays down fairly quickly, trying as much as possible to use the shortest distance between two points. But when it comes to attaching detonators to high explosives and then placing those explosives into holes, one becomes more focused and precise.

Jargon words are something like those high explosives. For a variety of reasons, they are "supercharged." Badly manufactured or mishandled, they can destroy understanding; made and handled expertly, they remove barriers to understanding; they carve out thought efficiently, quickly, precisely. But you want to place just the right number of charges, of just the right size or power, in just the right places.

If jargon can be used well or ill, it must be no worse than a neutral term. But as it happens, the very word "jargon" sets off an explosion in the heads of many people. They do not recognize the neutral sense of the word as its primary meaning; when they hear or read the word, they immediately think of all kinds

³² Investigations in cognitive psychology lie outside the scope of my article. But again, for a good treatment of style that references (among other things) both Herbert Spencer and studies in psycholinguistics, see Hirsch [45].

of stylistic evils. But it is important to separate out the "ugly conditions of language" and recognize that jargon is not one of them unless it is *bad* jargon—and even then it is only one of those conditions.

If there can be ugly conditions of language, there can also be beautiful conditions. As concerns the good jargon used in scientific and technical prose: if it does not always rise to the level of esthetic beauty as found in some other kinds of writing, it can achieve at least the Roman ideal of functional beauty—regarded by some as a very high form of beauty indeed.

As for Mr. Spencer's theory about conserving mental energy by using shorter words, non-technical words, Anglo-Saxon words—"other things being equal"—it reminds me of Albert Einstein's statements that "Everything should be made as simple as possible, but not simpler" and "Any intelligent fool can make things bigger and more complex. . . . It takes a touch of genius and a lot of courage to move in the opposite direction." Those are very interesting thoughts from the mind of such an intelligent person. If anyone could live and think and speak in an abstract, complex realm, Einstein could. He was rather impressive in that regard. So why did he value simplicity?

I think it was mostly because he wanted to share with others, at all levels, the things he knew, and because he himself was "passionately curious."³³ Getting knowledge involves, among other things, reading and listening a lot. It takes time, and it takes energy. (It may even take acceleration; I don't know about mass.) When communication is clear, accurate, and as economical as possible, we save time and energy—mental energy, the energy we expend in comprehending the form and meaning of words and entire discourses.

Einstein and Spencer agree that everything, including every sentence we speak and write, should be made as simple, as energy conserving, as possible (but not simpler, not to the hurt of other qualities we value, such as accuracy, power, pleasure, and so on). This is of course an unreached goal for every communicator, but we stretch for it. Economy and simplicity of expression are not limited to the question of jargon usage, but proper use of jargon is a huge issue in scientific style, for subject matter experts and editors alike.

I'm preaching to the choir if I tell scientists and other specialists that the jargon they use is vital to the economy and precision of their prose. However, somewhat like T. A. Rickard, I have alluded to not just the "necessary" dimension of jargon, but also to its possible "evil." If scientists and engineers and other professionals really are interested not only in precision but in economy, in efficiency of communication, in conservation of mental energy—they will become *judicious* users of jargon, even among themselves, writing "real science in straight English" to the greatest degree possible.

³³"I have no special talents. I am only passionately curious." —A. Einstein.

I know that's a lot to ask of busy scientists, engineers, and other professionals whose expertise is not primarily linguistic. That's one reason why we have a profession called scientific and technical communication. A big part of our job consists in serving as a bridge between specialists and sundry audiences—sometimes other specialists in the writer's own field, sometimes fellow scientists and decision makers in other fields, sometimes a lay public with strong vested interest in understanding what the specialists are saying. This requires technical communicators to be master manipulators of jargon.

We should be good conservators of the reader's mental energy, but we must also be careful preservers of specialized vocabulary when those words really are the best ones. Further, we should have a clear sense of what distinguishes good jargon from bad jargon and from all the other ugly conditions of language. We should not only have a red pen at the ready for slashing at those bad and ugly features of scientific and technical prose; we should be the best-informed champions of *good* jargon and the staunchest defenders of its name.

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