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Fossils in Technical Terminology

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People who sense a need to find and preserve basic truths of existence for the benefit of themselves and future generations often find comfort in assuming that language stability can be found in abundance among people who do place a premium on precision and accuracy and that the areas of science and technology in particular will be well fortified against attacks on stability. We are reminded frequently that Latin is used in the professions of law and medicine because, being a relatively dead language and limited primarily to those two professions, it is not subject to the winds of change that can rain down neologisms or bring in murky overcasts to obscure the language of John Q. Public or Jane Q. Private. Certainly, the language of science and technology does demonstrate more stability than is encountered in common speech, but it would be a mistake to assume that these areas of human endeavor are somehow insulated from the forces that influence language in general. No segment of our society has succeeded in creating whole vocabularies that are clear, precise, accurate, and permanent. Regardless of whether a new term is being coined or an old word is being modified to convey new meanings, a common practice in science and technology is to aim at economy and clarity by some metaphorical comparison to something previously known. Thus we have planets, mountain ranges, and aerospace vehicles (as well as parts of our anatomy) named after Greek and Roman gods. As we look at the common bases of naming new things and actions (by shape, by function, by use, by trade, by material, by inventor, by user, or by location of the invention or use), we see words that have become permanently married to their meanings, words that have either become divorced from their original meanings or are in the process of separation, and words that have dropped out of use because they have been unable to form connections to new meanings. Some words seem destined to disappear (sometimes quite rapidly), and others seem likely to remain even though their original meanings do not. For the present purpose, we will use a metaphor drawn from the world of science and refer to those remaining words as fossils.

To a paleobiologist, a fossil is not the remains of an original life-form, it is the pattern of that original life-form preserved as a result of some other material gradually moving in to replace the original organism. When we find a fossil of a trilobite, for example, we do not find the original substances the trilobite was composed of. What we find is limestone or some other mineral that has gradually replaced the original body parts so that the size and shape (often even the texture) of the original are duplicated. Although these aspects of the original have been preserved to a limited extent, many other aspects (such as material, coloration, temperature, etc.) may be determined only by cautious inference, or they may be completely beyond hope of reliable reconstruction. Thus the debate continues as to whether the dinosaurs were warm-blooded or cold-blooded creatures and whether their color was as drab
as an elephant’s skin or as brilliantly varied as the bands of a coral snake.

Fossils, as used in the present context, are words that have clearly defined forms and convey clear meanings that exist after the original referents have vanished from common understanding. By acquiring new meanings, they continue to be legal tender in many disciplines long after the vaults containing the original gold backing have vanished. UFO is a classic example. Originally it was an acronym for Unidentified Flying Object, and I suspect that just about everyone has seen something flying through the air without being able to identify it with certainty. Now, however, it is a mark of gullibility or mental aberration to have seen a UFO because the meaning now is that a UFO must be some sort of extraterrestrial spacecraft filled with alien creatures (usually from Mars or some other nearby planet) who are obsessed with the desire to be taken to our leader, to conduct psychological or physiological studies on some abducted humans, or to wreak total destruction on the entire human civilization.

Technical terms that are subject to fossilization can be classified in various ways: by the degree to which fossilization has occurred, by the speed at which it has occurred, whether the process is ongoing or has terminated, whether the process is reversible, etc. Classifying them according to degree of fossilization yields three basic categories—those in which the process has gone to completion, those in which the process is still operative, and those in which the process has not yet begun but seems likely to occur. Thus we could have complete fossils, developing fossils, and potential fossils.

The existence of the complete fossils can only be theorized, of course, since the offering of any examples would be sufficient evidence that the original meaning has not been entirely lost. Perhaps the closest we can come to finding a complete fossil is to note the term we use for the marking substance of wooden or mechanical pencils. It is not lead at all. It is powdered graphite mixed with clay to provide rigidity. Many people would insist on the presence of lead, however, and might cite instances of school children experiencing actual lead poisoning that could be traced to the nervous habit of chewing on their pencils. Chemical analysis has revealed that the kids really did ingest lead as a consequence of that habit, but the lead was found to be an additive to the traditional yellow paint that covered the pencil. To a lesser degree, we have terms that designate days of the week, months of the year, and even the calendar itself. Most of us have been taught the origins of these terms but have found little need to remember them outside the schoolroom.

The logic of taxonomy also indicates a need to allow for potential fossils (just as astronomers long allowed for the existence of planets around other stars even though no actual proof of their existence could be offered). I am no more able to cite a specific example of a potential fossil than an accident insurance company can identify the kind and date of an accident that is to happen to that individual, but, as we shall see later, there are high- and low-risk categories that words can be put in according to general probability. This leaves us with the middle category of developing fossils as the primary category to be developed in this paper.

If we were to classify developing fossils according to type, we might group them in just three categories: fixed fossils, sequential fossils, and potential fossils.

The category of fixed fossils includes those words that have become immunized against subsequent change after having undergone a single transformation. A good example of a fixed fossil is "manufacture." Drawn from manus, the Latin word for "hand," the term originally meant to make something by hand (as a means of differentiating the action from some natural process). As modern machinery became available, the term came so clearly to mean the action of making something by machine (and only by machine) that new terms ("handmade," "handcrafted," etc.) had to be introduced to carry the original meaning.

Sequential fossilization occurs when the replacement material is replaced in turn by some subsequent material. Although it would be extremely difficult for this to occur in paleobiology, it is possible for sequential fossilization to occur in language—the fossil material itself being gradually replaced by other material that had no contact at all with the original. A classic example occurs in the Periodic Table of Elements that is widely used by chemists and physicists. After using a variety of ways for naming the basic elements found in nature, scientists found themselves in need of a name for a newly discovered element—one that had an atomic weight of 92. Because astronomers had recently discovered a new planet and had named it Uranus (in keeping with the practice of naming planets after ancient gods), element 92 was named Uranium. Following the planetary sequence, the following two elements (93 and 94) were named Neptunium and
Plutonium. (Having run out of planets at that point, the scientists went back to rather random naming for subsequently discovered elements, hence Californium and Einsteinium for elements 98 and 99.)

A more common example of a sequential fossil can be found at most breakfast tables. About half a century ago, the butter that was spread on toasted bread began to be replaced by oleomargarine. Some people would refer to the replacement as “oleo,” “margarine,” or “oleomargarine,” but in asking someone to pass it along the table, most people found it more convenient to say, “Please pass the butter.” I have not checked the content to be sure, but it now appears that oleomargarine is now in the process of being replaced by something labeled as “spread,” but I have yet to hear anyone ask for it by that name at the breakfast table. We still “butter” our toast.

The category of partial fossils includes those words having multiple meanings, at least one of which has either died or continued the original meaning with no appreciable change while one or more of the others has taken on such divergent meanings as to lose almost all connection to the original. Our telephone books, for example, continue to instruct us on how to “dial” a telephone. All sorts of dials can be found in our present world, but they have vanished almost completely from modern communication hardware. In the event that voice-operated telephones actually do become common, it is quite likely that we will continue to receive instructions on how to “dial” a number on them (even though, as a possible relief to some of us, the automated answering machines may have to abandon the use of “Press . . .” as a means of either routing our calls to the appropriate individual or of subtly keeping us effectively exiled to a “hold” position.

Further examples of partial fossils include “trunk” and “joystick.” Although the old “steamer” trunks are rare, trunks of various sizes and shapes can still be purchased along with suitcases for the purpose of storing and transporting clothing, but they are no longer roped or strapped to the back of automobiles. Over the past century, automobile design has evolved to the point that the trunk has gradually been assimilated and has become an integral part of the vehicle. “Joy-stick” acquired an initial burst of popularity as the main device for controlling the pitch and roll of early aircraft, especially those used in World War I when aircraft were relatively primitive as weapons of war. As military aircraft developed in size, power, and sophistication, the stick acquired additional functions and activated electrical and hydraulic systems, rather than control surfaces directly. The same was true for civilian aircraft, but for small civilian aircraft and for all multiengined aircraft the shape of the basic control was modified sufficiently to be redesignated as a “yoke.” Even though a pilot may acquire thousands of flying hours behind a yoke, those hours of experience are still frequently referred to as “stick time” rather than “yoke time.” When one encounters “joystick,” however, it is most likely to bring to mind the external control that youngsters use in managing a computer game. The external computer control more frequently used by adults is the “mouse.” Since real mice are less likely to change or to become extinct, “mouse” is more likely than “joy-stick” to resist subsequent fossilization.

Terms subject to fossilization can also be classified according to their longevity—some are quite fragile, surviving only briefly after their models have vanished, but others are quite durable and seem destined to survive well beyond the time when any accomplished linguist can claim to have identified the nature of the original. “Airship” survived only briefly after large dirigibles (such as the Hindenburg) went out of favor and made comparison of airborne vehicles to seaborne vehicles less practical, but pilots of all kinds of aerospace vehicles continue to “navigate” their machines through many layers of atmosphere and even the vacuum of outer space without much regard for the lack of water. Very few crew members of seagoing vessels have had any actual experience with sails as a means of locomotion, but it is easy for us to recall the days when wind power was the motive force, so “sailor” and “sailing” survive. A nautical term that has undergone either virtually complete fossilization or only apparent fossilization in one of its forms is “nautical” itself, the root word for a measurement of speed that seagoing people are more prone to refer to as “knots.” Now it does seem well established that “knots” was derived from the act of throwing a knotted rope overboard to measure the speed of a moving ship, but the similarity of the sounds and the proximity of the meanings allows for very easy melding of the two terms. By comparison, “seaman” is a word destined for extinction rather than fossilization as we search for a more inclusive term that does not exclude sea-women.

Let us move now to classifying technical terminology in the order of decreasing resistance to fossilization. At the top of the list are those terms that are drawn from some observable aspect of the
physical universe. Terms that take their meaning from the shapes, sizes, textures, temperatures, colors, and behavior of natural objects, organisms, or phenomena that were familiar to our distant ancestors and can be expected to be familiar to our distant descendants are unlikely ever to become fossilized, at least not in our lifetime. As long as we have fires, floods, oceans, seashores, mountains, plains, valleys, tides, landslides, earthquakes, clouds, rain, hail, snow, wind, and celestial bodies, we can expect the original terms to survive with little change, even when we employ them in such diverse senses as “starfish” and “star drill.”

We have two huge reservoirs to draw from here—the physical and the biological. If we accept the view (one held by scientists and theologians alike) that life began after the world was created and that it might be ended by some divine gians alike) that life began after the world was such diverse senses as environment), we realize that the biological world or some gradual or sudden alteration of the tic references that are quite resistant to the forces with little change, even when we employ them in such inclusive duration (and of such great var­ istic relationships (fractions and multiples such as half, three-quarters, and double) will endure with their original meanings.

Words having alphanumeric origins fall a bit lower on the scale of resistance. We have little difficulty thinking of a construction worker using an “A-frame,” a carpenter using a “C-clamp,” a canoeist making a “J-stroke,” a plumber using a “P-trap,” a mechanic using a “U-bolt,” or a drafts­ man using a “T-square.” These obviously derive their names from the shapes of uppercase letters in our alphabet, and a person quite unfamiliar with the intended meaning could quite easily sketch the shape of the things referred to simply by supposing they had the shapes of familiar letters. (“Upper­ case,” of course, is a typical example of a nearly fossilized term. Nonstudents of language rarely have any notion of the original meaning of “case,” so “upper” and “lower” are as likely to bring to mind the position of the keys of a manual type­ writer.) When a term relies on more than a single similarity (such as shape or size) or its connection, it seems doubly “grounded.” In military terms, a U-boat may be thought of as one that travels in the shape of an uppercase “U” (down, across, and up to the initial level, but also one that draws its meaning from the abbreviation of the German designation (Untersee boot), which has little to do with the shape of any letter. Because of the great standardization of printing in our day, we can expect to see small changes in shape among letters of the alphabet, but most of us are still conscious of early American documents in which the “s” came out looking like “f.”

Unlike letters, numbers are used for the values they represent rather than for the shapes they resemble. With the possible exception of 8 (as in a knot or in reference to an aerial maneuver),
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numbers are much less likely to be used according to their shapes. They depend on their values: "a ten-speed" for a bike, "five-by-five" for loud and clear radio reception, etc. And they are subject to cultural variation. When my Korean houseboy used to tell me that I was number ten, he was registering a distinctly lower value than when Dudley Moore referred to Bo Derek by that number in a movie entitled 10. Numbers are frequently used as primary designators. They may be used alone (as they are in designating firearms: a .22, a .38, a .45, a .30-30, a .30-06), or they may be used in combination with letters or complete words (as they are in designating military and civilian aircraft: an A-6, a B-52, an F-16, a KC-135, a Boeing 747, a Lockheed (1011). In neither case do they lend themselves to fossilization. When the last referent dies, the term ceases to have currency except in historical references. "Davies" for automobile no longer has currency. "Sinclair" may well bring to mind an oil company but hardly the innovative computer by that name.

When the referents are less stable than natural phenomena, geometric concepts, or the letters of our alphabet, the opportunity for words to become fossils greatly increases. Technical terms that focus directly on humans and human creations are the least likely to resist fossilization, but even within this large group we can find varying degrees of resistance. The terms most likely to retain fixed meaning are those that refer to fixed places, principles, or phenomena named after their discoverers or inventors: the Hertzsprung–Russell diagram of stars (after Ejnar Hertzsprung and Henry N. Russell), the Bernoulli effect (after Daniel Bernoulli), the Bessemer converter (after Sir Henry Bessemer), the Braille Alphabet (after Louis Braille), Morse Code (after Samuel Morse), and Brinell hardness (after Johan A. Brinell). Nevertheless an electronic technician could spend a productive career without knowing that "kiloahertz" and "megahertz" replaced "kilocycle" and "megacycle" as a means of honoring Heinrich Hertz or that we are indebted to Andre Marie Ampere for "ampere" and to George Simon Ohm for "ohm." A lab technician working with radioactive materials might be unaware that the remotely controlled hands known as "waldoes" were first used in fiction by a character created by Robert A. Heinlein.

Some of these terms (particularly in the area of manufacturing) may get a new lease on life while undergoing partial fossilization by being used to identify the organizations that make or distribute a given product. "John Deere," for example, may refer to a man, to a company, or to a tractor made by that company. Marked shifts in meaning may occur when a different company takes over the manufacture or distribution of the product or when the same company changes the nature of its product (as occurred when "Studebaker" came to refer to an automobile rather than to the horse-drawn wagon that preceded it and when "BSA" came to mean a motorcycle rather than war material produced by British Small Arms). Less stability occurs when the human is less directly involved. We are not likely to see "Lou Gehrig's Disease" come to mean anything else, but we have seen what popularity and political status have done to such place names as Hoover Dam (temporarily renamed Boulder Dam) and Cape Canaveral (renamed Cape Kennedy briefly until "Kennedy" was reassigned to the spacecraft launching facility there).

The area of technical terminology most likely to face either extinction or fossilization is that in which human artifacts and procedures draw their names from previous artifacts and procedures, since change can occur at both ends of such linguistic equations. Thus we have automobile "hoods," plumbing "bonnets," "street" elbows, "caisson" disease, "briefcase," "attaché case," "needle" bearings, "pillow" blocks, "rack and pinion" gears, "pill boxes," "keyhole" saws, "satin" finish, "tin" snips, "pie" charts, and aerospace vehicles known as "shuttles." Some members of this category are reasonably secure ("oxbow" for lakes formed in river channels and "cape" for a projection of land into the sea), but the category as a whole must be considered high risk. The instability of this group can be suggested by "clockwise," a term that seemed destined for major change when digital clocks and watches threatened to become the standard but survived comfortably when large numbers of people found they preferred to see hands rather than numbers when checking the time of day.

Scattered along the spectrum of developing and potential fossils, we find a multitude of terms differing in degrees of resistance: those drawn from location of origin (India ink, Brazil nut, Shetland pony); location of use (alpenstock, western saddle); prominent user (Nehru jacket, McClellan saddle); distinguishing feature (slip-joint pliers); original or common material (marbles, fiberglass); and method of formation (telegraph, photosynthesis, smog). These differ so greatly in their bases of classification and can
slide so easily from subcategory to subcategory that it is dangerous to attempt generalizations. (A steel tape, for example, is made of steel, but a wood screw is not made of wood. A metal screw is made of metal but is not so named because of its material. A manhole is unlikely to be used by a fox, but a foxhole is very likely to be used by a man.)

A final category deserves brief mention—the category of arbitrary designations. This category includes a remarkable range of language—all the way from “color,” “flavor,” and “charm” used by physicists to identify subatomic particles known as “quarks” down to “doohickey,” “gadget,” “thingamabob,” and “hootenanny” used by people of no particular education to refer to things that either have no definite name or that do not seem to warrant the effort needed to learn it. Our chemists have given us “rayon,” “nylon,” “orlon,” “teflon,” and “Bucky balls” along with a host of other names that are likely to remain constant, in contrast to such trade names as “Kleenex,” “Macintosh,” “Jeep,” etc. (which can be broadened into generic terms or come to refer to an evolving product quite unlike that which initially was designated). Probably the most familiar example in modern language of an arbitrary trade name is the coining of “Kodak” by George Eastman for his roll-film camera. The term quickly obtained recognition, and more than one generation of people spoke easily of buying, borrowing, using, or losing a Kodak. But this is also a familiar example of a term that has undergone continual fossilization. With the plethora of cameras presently on the market, and the majority of them coming from Japan, and varying so greatly in purpose, price, and features, “Kodak” is very rarely used now to refer to an actual camera, and when it does, it may not refer to a roll-film camera. The term has moved, becoming an adjective (Kodak film) or a noun for the organization that specialized in the manufacture and sale of products having that trade name.

In summary, we have several classes of technical terms, arranged in order of decreasing resistance to fossilization (which is generally a direct correlation to the resistance of the initial referent to undergo change):

1. Terms drawn from naturally occurring objects and forces
2. Terms drawn from plant and animal life (including humans and the whole range of microorganisms)
3. Terms based on geometric configuration and alphanumeric similarities and relationships
4. Terms that refer directly to inventors, discoverers, practitioners, or just persons to be honored in some fashion
5. Terms that refer to human creations or behavior. The more durable the artifact, the more likely the term is to survive with its original meaning

Whether a term will undergo fossilization and continue to exist with a new meaning or whether it will just disappear once it gets detached from its original meaning is subject to many factors. The more common pattern is to fade away and enter the realm of antique terminology, a pattern that John S. Harris discusses in a paper at this symposium proceedings. But when need, convenience in spelling, and ease in pronouncing and remembering combine to provide a proper environment, the form will continue to exist despite extensive and successive alterations in meaning.