

THE LAST WORD/

BIOHAZARDOUS WORDS

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Bio-this and bio-that. Germ warfare has become bioeap-ony or bioterrorism. The use of microorganisms for pollution control is bioremediation. Bioresearch by bioleuths applying their bioskills in biostudy ultimately leads to bioinventions. If these prove novel, useful, and non-obvious, they may become biopatents. Engineers now tackle the problems not of mass transfer, but of bioconvection. Biotechnologists of all hues no doubt experience severe biopressure and biostress as they wrestle with vexing bioethical questions.

The use of the "bio-" epithet extends beyond the esoteric enclaves of the research-and-development community. Farmers are in the bioagribusiness. Finned, cold-blooded sea creatures are biofish.

Some bio-words invite alternative definitions. Is biosecurity assured by microbial Rottweilers, or are they simply biohazards? And what is a bioengineer, presumably the transgenic progeny of a homologous cross-over event involving a biochemist and a chemical engineer? Some words are fairly biospecific: biofermentor and biolipstick, for instance. Others are more vague, from the practical and all-encompassing biophenomenon, biosubstance, biodevice, or bioobject to the presumably compassionate and warm biocare and bioempathy.

Some "bio-" words have been around a long time and have, or have acquired, very clear meanings: biosensor, biochemistry, biological, bioassay, biosynthesis, and bioconversion are all eminently sensible. But in other cases, the meaning has gone or was never there.

"Bio-" used to mean "life" or "of life" but now it has to work harder. For cosmetics, it must imply naturalness: the Kanebo (Tokyo) BIO range includes BIO Super Lipids, BIO YNA (a yeast nucleic-acid extract), and BIO L-Hyaluronate. As part of a company name, it must convey an aura of high technology, respectability, and excitement while hinting at an association with biology: hence, alphabetically (with but few exceptions), BioAnalytics (Palm City, FL), BioBlock (Angouleme, France), BioChrom (Berlin, Germany), Biodor (Laufelfingen, Switzerland), BioEurope (Paris, France), Bioferon (Laupheim, Germany), Biogen (Cambridge, MA), BioHellas (Athens, Greece), Bio-intermediare (Groningen, The Netherlands), Biokit (Barcelona, Spain), Biolytica (Lund, Sweden), Biomira (Edmonton, Canada), BioNative (Umea, Sweden), Bio-Orbit (Turku, Finland), Bioplan (Sao Paulo, Brazil), BioQuest (Frolunda, Sweden), Bioreba (Basel, Switzerland), Bioscot (Edinburgh, U.K.), Biotal (Cardiff, U.K.), Biox (Jarfella, Sweden), Bio-Yeda (Rehovot, Israel), and Bio-Zac (Jarfella, Sweden). In this context, the use of "Bio-" is obviously extremely useful: it concisely and boldly

announces that these companies are involved in some way with biotechnology.

Interestingly, the gain in popularity of "bio-" correlates with the demise of "biotechnology." Since 1987, "biotechnology" has appeared less frequently in the scientific literature. Defined to death by august bodies and used to encompass too wide a range of science and technology, "biotechnology" has been transformed from buzzword to cliché. It has lost the shine it had a decade ago. Biotechnology is now something to be questioned, something the surface of which must be scratched, something to be looked into in more detail to reveal its true meaning.

"Bio-" words are sometimes banal and often annoying and unnecessary, too. But that is not very much to get excited about. Yet there is a serious issue here as well. They can be confusing, even obstructive, to understanding—sometimes, perhaps, deliberately so. Uninitiated investors, for instance, are swamped with pseudoscientific jargon. They are given a bioeconomic outlook, they watch bioindicators, they seek bioprofits, assess new bioventures, and they want to know about the latest biotrends. The recent success of certain notable bio-stocks has created a flood of bioinvestment, money that might not have been forthcoming for other start-ups.

Carefree use of the "bio-" prefix has led to the inappropriate clumping of ideas in the minds of the wider public. When bioproducts (or the products of biotechnology) are everything from beer to enzymes to antibiotics to drugs to transgenic animals, there is no easy answer to the question, "Do you want bioproducts?" Bioethics encompasses the human genome project, surrogate mothers, eugenics, genetic information, gene therapy, patenting life, and genetic fingerprinting.

It will be difficult to avoid "bio-" altogether. In scientific writing, jargon is a necessary shorthand which enables rather than obstructs precise communication. But the overuse of ill-defined terms can subvert one of the main aims of science—the accumulation and spread of knowledge and of understanding. We, now unfashionable as biotechnologists, should try to ensure that the cyphers we create and propagate are carefully defined and consistently used.

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