Letters

A Long Tale

The caption for the cover photo of *Science* for 23 March reads "Comparison of the skeletons of the lion (*Felis leo*) and bobcat (*Lynx rufus*) to the same scale." The skeleton in the foreground has far too long a tail to be a bobcat, and the skull also appears suspiciously elongate. I suspect that this is a case of mistaken identity; the skeleton in question appears very similar to that of an ordinary house cat (*Felis catus*).

ROBERT W. SEABLOOM
Department of Biology,
University of North Dakota,
Grand Forks 58201

I took home my copy of the 23 March issue of *Science* specifically to show its cover to my youngest son, 14, who is a budding naturalist. I wondered, peripherally, how he would react to the designation of the larger skeleton as that of "*Felis leo*" (most of us regard it as *Panthera leo*).

Steve, who is no theoretician, wasn't really interested in quibbling about Linnaean nomenclature, but he has a naturalist's eye. "What's a tail doing on that bobcat?" he inquired. Incidentally, what *is* a tail doing on the "bobcat"?

J. M. KISSANE
Department of Pathology, School of Medicine, Washington University,
St. Louis, Missouri 63110

The small animal skeleton in the foreground of the cover photograph accompanying my article, "Size and shape in biology" (23 Mar., p. 1201), was incorrectly identified in the caption as a bobcat. In fact it is an ocelot (*Felis pardalis*). Bobcats, I am told, don't have long tails.

T. A. MCMAHON
Division of Engineering and Applied Physics, Harvard University,
Cambridge, Massachusetts 02138

Vietnam Resolutions

I agree with Eldon Nielson (Letters, 13 Apr., p. 133) that the AAAS Council was unwise in passing the Vietnam Resolutions. Our constitution specifies our purposes, and our members assume that the business of the council is to further our constitutional objectives.

In this age of "total involvement," many scientific organizations find themselves in awkward positions resulting from the emotional zeal of some of their more vocal members. One may wonder whether this aggressive attitude is not more of a push for personal prominence than for organization welfare. It would be better for us all if scientific organizations (presumably rational) would stick to their knitting (or their constitution) rather than flying off on emotional tangents. As individuals, members of scientific societies have plenty of opportunity to express their political (and moral) views, without messing up the organizations to which they belong.

AAAS, in its Congressional Fellow Program (Editorial, 13 Apr., p. 139) seems to be fulfilling its proper political function according to our constitution.

CHAUNCEY D. LEAKE
School of Medicine,
University of California,
San Francisco 94122

Nielson's letter objecting to the AAAS Vietnam Resolutions claims that such actions are "outside their [members of the AAAS Council] realm of competence and authority." Is that not a mistaken view, not only substantively but formally as well? Surely members of the council are chosen for their abilities to go beyond their fields of scientific study, and election carries with it responsibility to so exercise those abilities. Otherwise, for what purpose ultimately does the AAAS exist? We are not obliged to agree with actions taken, but, as in any democratic society, we are free to raise objections.

HENRY PETTIT
907 Seventh Street,
Boulder, Colorado 80302

Plastic Trees

It is no wonder that Martin H. Krieger ("What's wrong with plastic trees?" 2 Feb., p. 446) feels "quite uncomfortable" with his discursive inquiry into the rationales of preserving unique environments. His work is interestingly eclectic, but it is not likely to move us very far in the direction that both of us would like to go. Let me suggest why.

It is true that before some element of the environment can be valued it must be identified, that is, differentiated from the background mass. This is what Carl Jung (*1*) called the "second creation." Martin Buber (*2*) put it more forcefully than almost anyone else when he wrote, "The sense world is only a stage. . . . As the linden tree waited for me in order to become green, so did nature, the unperceived, x-nature, once wait for living beings to arise through whose meeting perception the green, the soft, the warm—all the qualities conditioned by the senses—should come into the world." He also wrote, "All perception, but especially that deepened to vision, is intent on figure." To Buber, the artist was the supreme figurator, but I suggest that the ecologist who tries to work holistically is also a figurator who now deals with more crucial elements than the artist. The artist, through his vision, "transcends need and makes the superfluous into the necessary" (*2*). But we have been so enamored of this relatively new sleight of hand we are capable of that we have neglected basic needs, and this is why we are now forced to develop ecological analysis.

Krieger is aware of some aspects of this new figuration but confuses the various forms of rarity, lumping what is objective with what is merely contrived. His emphasis on salesmanship in getting people to accept new forms of "wilderness" or rarity is symptomatic.

I suggest that this confusion arises from the failure to clarify the history (past-present-future) of our environmental awareness. Granted that the

mainline of conservation doctrine stems from Theodore Roosevelt and Gifford Pinchot and is now expounded in marginal economics; granted, also, that the "ecology movement" of the 1970's is a distinct social mutation. The need now is to recognize that these two movements are the obverse sides of the same coin, and that only ecological insight can join them in the service of man. Life is an art, but science is essential to keep our artistic and intellectual inventions functional and ecologically viable.

We have a lot of trouble with this because, as figurators, amateur or professional, we literally invent nature, or at least our quasi-mythological views of nature. Bronowski and Bellugi (*3*) made us aware of the self-reference involved in all our definitions, but we can retain perspective by remembering that the real world of nature, as Whitehead saw, is everything that exists whether we think of it or not (*4*).

The modern problem is that of achieving the objective awareness that we are not independent of the natural ecosystems which have always maintained us, even though we have built seemingly self-sufficient environments (town and country) within the natural environment. The need is to zone our world according to the human uses it will withstand. Instead, almost everywhere man is using technological tricks to overextend himself into life zones that will not maintain him adequately. The world and man become poorer. It is probably a temporary delusion that we in the United States have solved the problems of production. We are maintaining our standards of living by skimming the world's resources and causing other populations to overextend themselves in the process of supplying us. To write, as Krieger does, that "A poor nation is unlikely to destroy very much of its special environments," is to admit that one has never looked at Latin America, or Africa, or poor nations anywhere else.

As Holdridge (*5*) pointed out, a properly zoned world would leave all mountainous forested lands in forest, since these are too steep, too wet, or too dry to graze or farm; it would allow grazing on the gentler slopes and confine crop agriculture to the fertile lowlands. Since such disciplined exploitation would impose a limit on human numbers, it would have to be accepted as rational policy, just as the prudent stockman limits the number of cattle on each pasture he manages. Other sensitive zones, like the estuaries, would

be reserved for the common property resources they produce, and not be sacrificed to the asocial greed of possessive individualism.

What is wrong with Krieger's and Disney's plastic trees, then, is that they perpetuate the delusion of man's independence from the life zones he occupies. The plastic tree is like the picture postcard of the Grand Canyon which the ecologically illiterate tourist uses as his standard of comparison. Until we begin to see the system behind the abstractions we invent, our future is tenuous indeed. No amount of incremental rationality, however clever, is likely to suffice to "save man from the catastrophic tricks of his own technology" if our basic strategy remains ecologically unsound. Krieger's faith in "our complex political and social organizations" is misplaced because, as Chamberlain (*6*) showed, growth itself is now a serious threat to these very organizations.

ROLAND C. CLEMENT
National Audubon Society,
950 Third Avenue,
New York 10022

References

1. C. Jung, *Memories, Dreams, and Reflections* (Random House, New York, 1961), p. 256.
2. M. Buber, *The Knowledge of Man* (Harper, New York, 1965).
3. J. Bronowski and U. Bellugi, *Science* **168**, 669 (1970).
4. A. N. Whitehead, *The Concept of Nature* (Cambridge Univ. Press, New York, 1920).
5. L. R. Holdridge, *Life Zone Ecology* (Tropical Research Center, San José, Costa Rica, 1967).
6. N. W. Chamberlain, *Beyond Malthus* (Prentice-Hall, Englewood Cliffs, N.J., 1970).

I was pleased to find one of my very favorite trees on the cover of *Science* (2 Feb.). How well I remember standing in line to climb it with my children at Disneyland in 1969. How I marveled at the luck of finding such a huge tree right where the park was being built; what a good idea to build the Swiss Family Robinson treehouse there! In addition to being a second-rate botanist, I can be distracted by children until my powers of observation are deadened to the point of gross error. What a surprise when I finally asked, "What the hell kind of tree is this anyway?" I reached out to touch a leaf and tried to act nonchalant about my discovery. Soon I was touching all the plants in Disneyland to learn how they survived the strain so well.

I'm glad we saw Mammoth Cave and Grand Canyon before Disneyland, because I found myself touching leaves in places like Yosemite, Crater Lake, and the Olympic Mountains after the shock of unreal realism in plastic.

A national park whose beauties are not well known, but much beloved, is Shenandoah in Virginia. It is unique because the land there was pummeled, pounded, and denuded by men before the Department of the Interior came along to protect it. They could have built plastic trees there, but they didn't. They just let it grow and grow. The views have been much obscured by the real trees in the last 30 years, but owls perch in the branches and swoop down to prey on unsuspecting rodents, while bears scratch the trunks, and visitors from the city quake at the strength of their claws. Most important of all, the real trees fill the air with oxygen and help to overcome the stench of the factory in Front Royal that can't be fenced out.

What's the factory making in the valley? I don't know—maybe plastic leaves for Disneyland.

JAMES R. BRENNAN
Department of Biology,
Bridgewater State College,
Bridgewater, Massachusetts 02324

Apropos of plastic trees, Joni Mitchell has described, in a part of the literature with which some of Krieger's readers may not be familiar, the frightening possibilities which make his excellent article so important. Therefore, I pass along part of her observation, much diminished by the lack of instruments ("Big Yellow Taxi" from *Ladies of the Canyon*, Warner Stereo 6376, 1969):

They paved paradise
And put up a parking lot
With a pink hotel, a boutique
And a swinging hot spot.

Don't it always seem to go
That you don't know what you've got
Till it's gone.
They paved paradise
And put up a parking lot.

They took all the trees
And put them in a tree museum
And they charged all the people
A dollar and a half just to see 'em.

Don't it always seem to go
That you don't know what you've got
Till it's gone.
They paved paradise
And put up a parking lot.

LEE S. HYDE
Committee on Interstate and Foreign Commerce, U.S. House of Representatives, Washington, D.C.

Ecology, per se, will not answer the questions that Clement brings up. They are appropriately dealt with by morals and politics, perhaps supplemented by scientific knowledge. Hence it still remains unclear whether ecology is bet-

ter or worse than art, or perhaps other sciences, at revealing basic needs, functionality, or the nature of the contrived versus the objective (*1*). Concepts of the natural seem to have been used historically to control what is thought to be possible (*2*). This is not to claim an unbridled relativism, but to remain skeptical of the contrary position (*3*).

Brennan is right, that *noting* that something might be different from what it seems does change things. Clarke shows how that noting seems to be involved in the confusion between the ordinary everyday attitude and the scientific (or philosophic) one (*4*). I conclude that many scientists' concept of *tree* is not the one they would use in the laboratory, but the one that they use on their outdoor walks. Probably it is true that only God can make such trees; of course that is exactly what I ignored in my article, although I hope to do justice to the problem in future work.

The virtue of the trees in the Shenandoah National Park is a result of the protective acts of the Department of the Interior, which were part of a deliberate design decision. If there are any pines among those forests, however, that design decision also resulted in the production of photochemical smog due to α-pinene, which is emitted from pine trees (*5*).

Hyde and Joni Mitchell may be right, "[t]hat you don't know what you've got [t]ill it's gone." But the greatest waste in the United States today is probably not of natural resources, but of human resources, as seen in poverty and unemployment.

John Krutilla has kindly informed me of an error in my reading of his work (*6*). This can be corrected by deleting the bracketed expression "[for the reversion rate]" from the quote beginning on page 451 of my article.

MARTIN H. KRIEGER

Department of Architecture, College of Environmental Design, University of California, Berkeley 94720

References and Notes

1. For a discussion of the relationship of art to basic needs, in past and present, see L. Steinberg, *Other Criteria* (Oxford Univ. Press, New York, 1972), p. 55.
2. Perhaps the most extreme, but well-thought-out, view is to be found in M. Heidegger, *Being and Time*, translated by J. Macquarrie and E. Robinson (Harper & Row, New York, 1962), p. 100. The "figurator" question needs to be carefully stated if it is to be part of ordinary activity; *ibid.*, p. 409.
3. The concept of "forms of life" as hinted at in L. Wittgenstein, *Philosophical Investigations* (Macmillan, New York, 1958), section 23, is probably the appropriate one here.
4. T. Clarke, in *Philosophy in America*, M. Black, Ed. (Cornell Univ. Press. Ithaca, N.Y., 1965), pp. 98–1 → *J. Phil.* **69**, 754 (1972).
5. L. A. Ripperton, H. Jeffries, J. Worth, *Environ. Sci. Technol.* **5**, 246 (1971); L. A. Ripperton and D. Lillian, *J. Air Pollut. Contr. Ass.* **21**, 629 (1971).
6. J. V. Krutilla, C. J. Cicchetti, A. M. Freeman III, C. S. Russell, in *Environmental Quality Analysis*, A. V. Kneese and B. T. Bower, Eds. (Johns Hopkins Press, Baltimore, 1972), pp. 69–112.

Warburg Theory of Carcinogenesis

In the article by D. H. Koobs about the relation between energy metabolism and cancer (13 Oct. 1972, p. 127), the name of Otto Warburg is not mentioned. This is strange in view of two aspects of the article. In the brief historical review, the fact that Warburg was already studying the energetics of cancer in the 1920's is not noted. Koobs suggests a theory in which a reduction in oxygen tension could lead to carcinogenesis. The resemblance of this theory to the old Warburg theory, in which irreversible injury of respiration leads to cancer, is not noted (*1*). Either Koobs is unaware of the Warburg theory, or else he does not cite it because of its present unpopularity. One may not agree with Warburg's conclusions, but it is only fair to give credit where it is due.

ADOLPH E. SMITH

Department of Physics, Sir George Williams University, Montreal 107, Canada

Notes

1. The relevance of the Warburg theory of carcinogenesis to modern cancer research will be discussed in an article by A. E. Smith and D. H. Kenyon, *Oncology*, in press.

I felt that the presentation of Warburg's theory, so widely known, would have been distracting; evidently its absence has distracted Smith and perhaps others. It does seem rather clear, however, that a reduction in oxygen tension which may lead to genomic derepression, changing the emphasis of energy metabolism, is a process which hardly resembles an "irreversible injury" to respiration. In fact, ascites cells growing under oxygen tensions too low for their normal counterparts to survive, continue to produce mitochondria having no apparent defects (*1*).

D. H. KOOBS

Department of Pathology, School of Medicine, Loma Linda University, Loma Linda, California 92354

References

1. J. B. Chance and B. Hess, *Science* **129**, 700 (1959).

Field Ion Microscopy

Ottensmeyer, Schmidt, and Olbrecht (12 Jan., p. 175) describe a technique for extracting images of sulfur atoms (atomic number $Z = 16$) from dark field electron micrographs of sulfur bearing molecules. They state that the lighter atoms have only been resolved with certainty by the dark field method. The authors imply that the application of the other techniques, field ion microscopy and scanning electron microscopy, are thus restricted in their application to studies of lighter elements. Such an implication is probably related, in the field ion case, to a very early literature citation dealing with that technique (*1*). It thus seems appropriate to note some of the recent advances in field ion studies of the lighter elements.

While field ion microscopy (FIM) is still in the development stage when compared to scanning electron microscopy and transmission electron microscopy, FIM even now can be used to image the individual atoms of the crystal lattice of light materials such as aluminum ($Z = 13$) (*1*) and beryllium ($Z = 4$) (*2*). Such images are *not* projected from films deposited on a heavy metal substrate, for example, aluminum over tungsten, but are generated from needle electrode specimens produced from bulk material. Furthermore, while it is necessary to use the more advanced methods of FIM practice (closely controlled cryogenic temperature levels, ultrahigh-vacuum background pressures, argon-ion imaging gas, channel plate image intensification) for observing aluminum, materials such as iron ($Z = 26$) and commercial iron alloys (steels) have been routinely studied with much less elaborate arrangements (*2*, *3*).

Gradually, as more results become available, FIM is being recognized as a tool for surface studies and for atomic scale microscopy. The results also demonstrate the wide range of materials which can be studied by the technique.

JAMES A. CLUM

Department of Metallurgical and Mineral Engineering, School of Engineering, University of Wisconsin, Madison 53706

References

1. E. W. Mueller, *J. Appl. Phys.* **28**, 1 (1957).
2. E. D. Boyes, private communication.
3. E. W. Mueller and T. T. Tsong, *Field-Ion Microscopy* (American-Elsevier, New York, 1969); S. S. Brenner and S. R. Goodman, Sixteenth Field-Emission Symposium, Mellon Institute, Pittsburgh, 1969; J. A. Clum *et al.*, *ibid.*; M. H. Richman, Seventeenth Field-Emission Symposium, Yale University, New Haven, Conn., 1970.