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COVER

Maxwell's duiker (*Cephalophus maxwelli*), a small antelope of the West African forests. Duikers rub the secretion of the large scent gland in front of the eye, which exudes through a row of pores, on vegetation and each other's glands. See page 443. [Bill Meng, New York Zoological Society]

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pened not to turn out as a source of injury to them. Some were even quite humorous and I recommend reading the accounts if one is interested in bears.

Herrero's recommendations are excellent. I hope we never try to deliberately eliminate even mosquitoes from the national parks. Those afraid of injury should observe their bears in zoos and those who would like to observe them close at hand should know how to do it. They will not be injured either, even if they are able to find a grizzly. . . .

DONALD C. LOWRIE
Zoology Department, California State College, Los Angeles 90032

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1. P. R. Cutright, *Lewis and Clark: Pioneering Naturalists* (Univ. of Illinois Press, Urbana, 1969).
2. R. D. Burroughs, Ed., *Natural History of the Lewis and Clark Expedition* (Michigan State Univ. Press, East Lansing, 1961).

Herrero correctly named me as a supporter of the proposal to remove grizzly bears from parks such as Yellowstone and Glacier and then labeled the proposal both undesirable and "clearly contrary to the obligation stated in the statutes" under which our national parks were established.

Herrero himself recently pointed out (*1*) that "few people would suggest reintroducing the grizzly into the back country of the Sierra Nevada National Park areas. Back country use by people in the Sierra is simply too great to permit such sharing." Thus the main difference between our positions reduces to whether or not people should be permitted, indeed encouraged, to get out from behind their windshields and hike as they are doing in the Sierra park. It is worth noting that in the new German national park in the Bavarian Forest grizzlies will not be reintroduced.

The extensive statistics cited by Herrero on the miles hiked, grizzlies studied, and man-hours devoted by the Craigheads in Yellowstone without serious injury are no doubt accurate although the Craigheads reported (*2*) that their "information was not gleaned without risk. Time and again we have been treed by bears." It is difficult to see how the experience of a group of professionals, usually armed at that, applies to the average hiker or camper.

An Act of Congress established Yellowstone in 1872 both as a "pleasuring-ground for the people" and for "the preservation of all the timber, mineral deposits, natural curiosities, and won-

ders within said park." As soon as roads through the park and Old Faithful Inn were built, the inherent conflict of purposes became apparent. Clearly, if the first part of the 1872 obligation is to be fulfilled, some compromise is inevitable in the second. Furthermore, no one generation can in fact forever bind future generations. . . . Even though laws remain the same, as decades pass and new circumstances arise, the laws tend to be reinterpreted.

We can all agree that feeding garbage to grizzlies in national parks should stop. But will the Park Service, which does such a superb job in so many ways, continue to enforce no-feeding rules after the present excitement has subsided? I have seen garbage fed to grizzlies every night under the eyes of unprotesting park rangers even though it was in flagrant violation of regulations.

Last, some caution is in order before accepting Herrero's theme that "the highest function our parks can serve" is to give man a sense of being "part of nature." This is a complex and slippery idea. Does he imply that the man studying biochemistry or atomic physics is not as fully and deeply immersed in the study of nature as the man hiking the back trails and thinking about grizzly bears? Most of us believe we find mountain scenery ennobling, something which uplifts the mind and heart. Yet Hitler found his inspiration in the Berchtesgaden Alps. There simply is no assurance that a sense of union with an alpine ecosystem including large and savage carnivores will automatically be a civilizing experience.

GAIRDNER B. MOMENT
Department of Biological Sciences,
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Baltimore, Maryland 21204

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1. S. Herrero, *BioScience* **20**, 1148 (1970).
2. F. Craighead and J. Craighead, *Nat. Geogr. Mag.* **130**, 252 (1966).

Measuring Radioactive Materials

We have noted with interest the correspondence on the subject of the mislabeling of radioactively tagged chemicals, culminating with the letter (4 Dec.) from A. Broido entitled "More mislabeling—more frustration." Broido rightly points out the hazards of using, to say nothing of supplying, solid "standard" sources of such low specific-activity, low-energy beta-particle emit-

ters as ^{14}C. The difficulties inherent in the measurement of solid ^{14}C sources as a result of absorption and scattering have recently been discussed by Wood (*1*).

Because of such problems arising from absorption and scattering, the emission rates per curie from solid sources of the same low-energy beta-particle emitter can vary quite considerably, depending on their chemical composition and geometrical configuration. Since it is impossible to calibrate such solid sources nondestructively, the National Bureau of Standards has never offered calibration services for this type of source.

Where the assay of a ^{14}C sample cannot conveniently be carried out by liquid-scintillation or gas counting we have, in the past, recommended the preparation of a working standard custom-made for the particular experiment. It is inadvisable that such a working standard be made by anyone but the user himself. Thus we have suggested that our Na_2CO_3 solution standards containing ^{14}C can be satisfactorily used for the assay of ^{14}C samples by preparing a working laboratory standard, into which a quantitative "spike" of our standard has been introduced at some appropriate stage in the preparation of a sample, with the analysis carried out in *exactly* the same manner as for the samples that are to be assayed.

Price lists of our standards for use in the assay of ^{14}C, including [^{14}C]-*n*-hexadecane and [^{14}C]benzoic acid in toluene for liquid-scintillation counting, and of other low-energy beta-particle solution standards, such as ^{3}H, ^{63}Ni, and ^{147}Pm, can be obtained from the Radioactivity Section of the National Bureau of Standards. Lists of our radioactivity calibration services are also available. Information and guidance on problems arising in radioactivity measurements can be found in a number of texts such as, for example, NBS Handbook 80, *A Manual of Radioactivity Procedures*, available from the Government Printing Office or the Radioactivity Section. Personnel of this section are also available for consultation on such problems.

S. B. GARFINKEL
W. B. MANN

Radioactivity Section,
Center for Radiation Research,
National Bureau of Standards,
Washington, D.C. 20234

Reference

1. K. G. Wood, *Int. J. Appl. Radiat. Isot.* **21**, 581 (1970).

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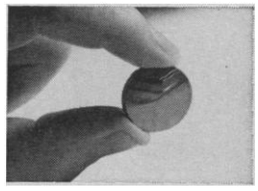

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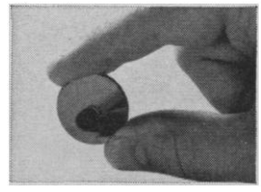

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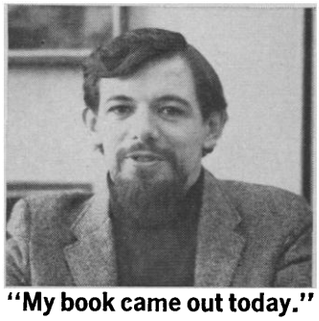

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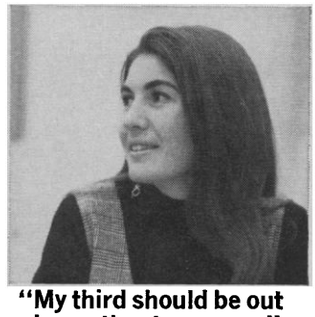

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Control of Agricultural Pests

Our nation has been blessed with high-quality, dependable supplies of low-cost food and fiber. But few people are aware of the never-ending battle that makes this possible. Among the insects, about 10,000 species are known to damage crops, forests, or livestock. If left undisturbed, some of these pests would take more of the crop than would the farmer. Agriculture must cope not only with native enemies but also with invaders from abroad. Increasing air travel has expanded the probability of bringing in pests from all over the world. For these, natural controls such as parasites are often absent.

During more than two decades, agriculture has depended heavily on chemical pesticides such as DDT. But even in the 1950's it was apparent that DDT was not the final answer; resistant insect forms were emerging. The use of degradable chemicals such as the organic phosphates and carbamates has been expanding. However, these are acutely toxic to warm-blooded animals, including man, and to useful insects such as bees, parasites, and predators. For the long term it is desirable to develop methods of control that minimize the use of broadly toxic chemicals.

Some of these methods antedate the use of the chemical pesticides—for instance, the use of insect-resistant varieties of plants and the fostering of natural enemies. Promising methods of control that have recently been developed include the use of sex attractants and the release of competitive radiation-sterilized males. About 20 of the sex attractants have now been identified. Of particular importance is that of the gypsy moth, an insect that has been ravaging a rapidly increasing fraction of the hardwood trees of northeastern United States. The synthesis of the attractant and its use in conjunction with localized applications of insecticides give promise of timely intervention in what otherwise might be a dreadful destruction of vast stands of trees.

At the AAAS meeting in Chicago, E. F. Knipling described proposals to exploit techniques that he had previously used successfully to eradicate the screwworm in Florida. These same techniques have been employed to minimize the population of screwworms in Texas and adjoining states. In that area, eradication is impossible because of reinvasion from Mexico. However, the pest is more than 99 percent controlled at an annual cost of about $6 million and with annual benefits estimated at $100 million. Knipling pointed out that a limited number of pests account for a very major fraction of all crop damage. Under especially close study are the boll weevil, the codling moth, and the corn borer. The boll weevil alone causes losses of about $200 million a year, and about $70 million is spent by growers for chemical control. About one-third of all insecticides used for agricultural purposes are employed to control this single insect. Knipling discussed plans for a large-scale demonstration experiment to suppress populations of this insect in an area 250 kilometers in diameter. The plans involve a combination of treatments to diminish the overwintering population and an intensive program in the spring to trap insects by use of sex attractants. The survivors would be subjected to repeated release of 100 times their number of sterilized males.

The suppression or elimination of the use of DDT and related pesticides will constitute a hardship to many farmers. Prospects are reasonably bright, however, that satisfactory methods of specific pest management will be devised, and these methods will be more in keeping with our desire to minimize man's destructive impact on the environment.

—PHILIP H. ABELSON

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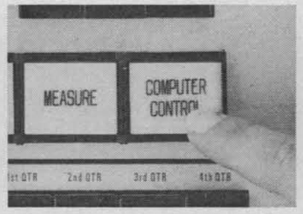

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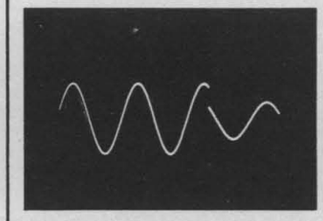

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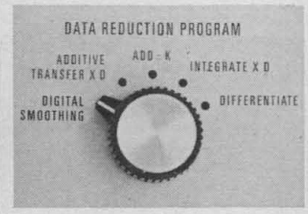

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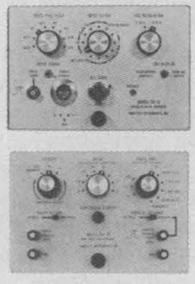

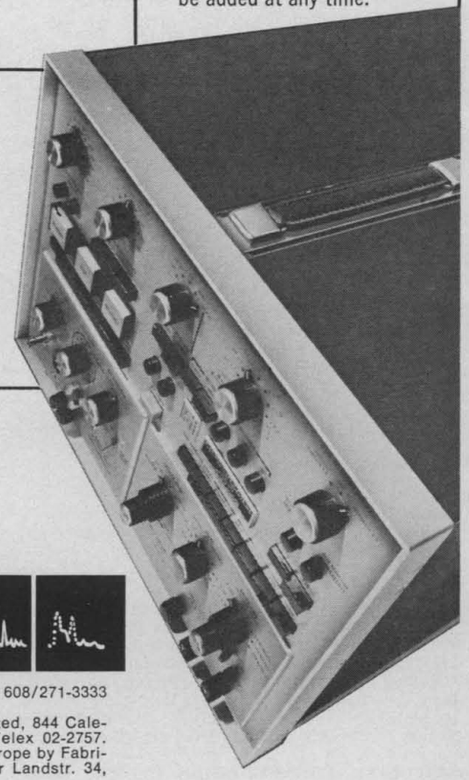

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