terial was visible, probably sodium fluoride. The temperature was then raised to 125°C, and after ½ hour the tube exploded with extreme violence. Nothing was recoverable.

Pentafluorotoluene. To the Grignard reagent prepared from 1.31 g (0.054 g-atoms) of magnesium turnings and 13.07 g (0.054*M*) of methyl iodide in 15 ml of anhydrous ether, was added 10 g (0.054*M*) of hexafluorobenzene. Slight refluxing of the ether was observed during the addition. The mixture was refluxed for 2 hours more, cooled in ice, and decomposed by the addition of 50 ml of cold 10 percent hydrochloric acid. The organic layer was separated, dried (Na_2SO_4), and the ether was removed. The residual liquid, 7.1 g, was analyzed by mass spectrometer and found to contain 65 percent unreacted hexafluorobenzene, 3 percent pentafluorotoluene, and 20 percent of a nonvolatile residue which has not been characterized (7).

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References and Notes

1. E. T. McBee, V. V. Lindgren, W. B. Ligett, *Ind. Eng. Chem.* 39, 378 (1947).
2. Y. Desirant, *Bull. classe. sci. Acad. roy. Belg.* **41**, 759 (1955).
3. J. A. Godsell, M. Stacey, J. C. Tatlow, *Nature* 178, 199 (1956).
4. M. Hellmann *et al.*, paper presented before the Industrial and Engineering Division, Fluorine Symposium, at the 130th meeting of the American Chemical Society, Atlantic City, N.J., Sept. 1956; *J. Am. Chem. Soc.*, in press.
5. W. J. Pummer and L. A. Wall, unpublished work.
6. G. M. Bennett, G. L. Brooks, S. Glasstone, *J. Chem. Soc.* 1935, 1821 (1935).
7. This article is based on work sponsored by the Bureau of Aeronautics, Department of the Navy, Washington, D.C.

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Homing in Nonmigratory Bats

Homing at high speeds (*1*) and over long distances (*2*) has been observed in species of bats which normally migrate and which may have some familiarity with the territory covered. Although the means by which a bat navigates in returning to its roost are not known, it is known that visual and auditory clues are important factors in the homing of birds (*3*). In order to test the importance of these factors in bat movements, experiments are being conducted with the big brown bats, *Eptesicus fuscus fuscus,* which seems to be nonmigratory in the Cincinnati, Ohio, area. Bats collected from roosts in Cincinnati were carried north or south and released in locations with which they were not familiar.

The 155 bats taken north were captured, weighed, and banded on 20 July 1957. These bats were divided into five groups according to the amount of wear on their teeth—the higher the number of the group, the older the bats in the group (*4*). This criterion indicates only the relative age and not years (*5*). However, the season's young, born during the last week in May and the first week in June, were distinguishable. Of the 155 bats, all of the 57 males and 47 of the 98 females were juveniles. Among the other females, 16 were from group 2, 21 were from group 3, 7 were from group 4, and 7 were from group 5. All of these females had borne young, and the mammary glands had regressed. On 21 July they were transported in the trunk of an automobile in cages surrounded with crushed ice, since the temperature was in the middle 90's. The bats seemed torpid.

The bats were reweighed and released in the late evening at Pilgrim, Mich., north of Frankfort, 450 miles north of their home roosts. The temperature was below 70°, and many of the bats had to be exercised individually before they would fly voluntarily.

The roosts were rechecked on 24 August. Three bats were recaptured, all adult females. Two of these—one from group 2 and one from group 5—had been banded for the first time on 20 July; the third, from group 4, had been recaptured from the same roost nine times in eight different calendar months over a period of 2 years. Two other bats were observed after release. One juvenile male was killed 3 days after release, two miles north of the point of release; another juvenile male was observed about a mile south on the day following release. On 26 Oct., four more females were recaptured after they had returned from Michigan, two from group 3 and one each from groups 4 and 5.

For the southern trip, only 18 bats (nine males and nine females) could be captured on 31 July in Cincinnati. Eight of the males and six of the females were juveniles; one male and one female were from group 2; one female was from group 3, and one was from group 4. These were released at Reelfoot Lake, Tenn., 340 miles to the southwest, on 2 Aug. 1957. The temperature was 95°F, and all the bats flew immediately upon release. On 17 Aug., two of these bats were recaptured at the original roost in Cincinnati. One was a female from group 4 which had previously been captured nine times in seven different calendar months, from April through December, over a period of 2 years. The other was a juvenile male about 2 months old. Another of the juvenile males released at Reelfoot Lake was killed in Charleston, Ill., on 10 Sept. This bat was already north of the latitude of Cincinnati and 200 miles to the west.

The big brown bats seem to be nonmigratory in the Cincinnati area, since individual banded specimens have been collected in ten different calendar months. Two of the bats that returned during these experiments had been recaptured nine times in the previous 2 years. The juvenile male about 2 months old was certainly not familiar with the territory covered. Both of the bats that returned from Tennessee gained weight on the trip, whereas five of the seven bats that returned from Michigan lost weight. Two of 18 (11 percent) bats returned from Tennessee; seven of 155 (4.6 percent) returned from Michigan. However, the difficulties encountered in collecting bats in large attics and barns make our recapture figures minimal, and no significance can be attached to the difference in percentage of bats returned.

In our experiments, bats returned 450 miles south within a month or less, and 340 miles northeast within 2 weeks or less, to their original roosts, over unfamiliar territory (*6*).

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References and Notes

1. H. C. Mueller and J. T. Emlen, Jr., *Science* 126, 307 (1957).
2. E. Smith and K. Hale, *J. Mammal.* 34, 122 (1953).
3. D. Griffin, in *Recent Advances in Avian Biology,* A. Wolfson, Ed. (Univ. of Illinois Press, Urban, 1955).
4. J. Christian, *Memorandum Report 53-16* (Naval Medical Research Institute, 1953).
5. J. Hall, R. Cloutier, D. Griffin, *J. Mammal.* 38, 407 (1957).
6. We appreciate the helpfulness of George McDuffie of the University of Cincinnati and of Dr. and Mrs. Robert McEwen of Oberlin College.

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6-Aminonicotinamide and Acute Degenerative Changes in the Central Nervous System

Two analogs of nicotinic acid and nicotinamide, 3-acetylpyridine (3-AP) and 6-aminonicotinamide (6-AN), cause toxic effects in mammals which are prevented by the administration of the metabolite and some of which resemble nicotinic acid deficiency (*1, 2*). Neurological changes appear to be a prominent feature of the intoxication. As examples, mice given 3-AP lose control of the hind legs and eventually become almost completely paralyzed (*1*); in nicotinic acid deficient dogs a toxic dose of 3-AP causes limb paralysis (*3*); and 6-AN in oral doses of 15 to 30 mg/kg produces in rats and rabbits loss of motor control and paralysis (*4, 5*). We undertook a toxicological study of 6-AN in preparation for its possible clinical use as an anticancer