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"the grounding of the entire shuttle fleet for much of 1990." The shuttle has scored some dramatic successes, such as 1993's daring repair in space of the disabled Hubble telescope. But political support has ebbed, and funds for operations have fallen.

Project Apollo succeeded in part because Cold War fears seemed to obviate the need for the government to satisfy a wide variety of interests. Such conditions are not likely to be seen again. In these more "normal" times, Kay concludes, "big science" may simply be too much for democratic government to handle.

## Puffinology

"The Puffins Keep Their Secrets" by Les Line, in *National Wildlife* (Aug.-Sept. 1994), National Wildlife Federation, 8925 Leesburg Pike, Vienna, Va. 22184.

Pity the puffin. Forever overshadowed by the penguin, this plucky sea bird leads a colorful life veiled in obscurity. Even careful scientific study, reports Line, former editor of *Audubon*, fails to reveal much about what puffins do or why.

Although puffins and penguins are similar in stature and demeanor, they are entirely unrelated and inhabit opposite ends of the earth. Like penguins, puffins swim well underwater and mob islands once ashore, but they can also take to the air. Puffins belong to the auk family of northern sea birds, populating islands in both the Atlantic and the Pacific. Penguins are confined to the far south seas of Antarctica. An estimated 15 million Atlantic puffins nest in Iceland, Newfoundland, California, and Maine. Pacific puffins—the rhinoceros auklet, the horned puffin, and the tufted puffin—number about six million and are spread from the Aleutian Islands to the Alaskan mainland.

Puffins disappear for eight months at sea. "What they do out there, even where they go in winter," Line notes, "remains a scientific mystery." They court and mate on water, sporting attractive bills, tufts, and horns whose brilliant colors disappear after the breeding season. The same eye-catching, trian-

gular bills later serve as chisels when the puffins come ashore to dig their nesting burrows and lay their eggs. With dogged persistence, they scrape and push their way into the island turf until their burrows are spacious and rock-free. Home remains home every year thereafter—to be redug and reused until, in some cases, the island is stripped bare by excavation, wind, and weather.



Such labors seem extreme for one egg—all that a puffin will lay in a season. Six weeks pass before the egg hatches and six more pass before the puffin chick is ready to experience sea and sand. During that time its parents are diving as deep as 200 feet in the ocean, several times a day, to fetch fat-laden sand eels and capelin (smelts) for their young. This nutritional treasure is guarded from pirating herring gulls in a unique way: puffins coming home from the hunt hover above their colony, forming a large group, and land all at once to discourage attacks on individuals. But against a far more serious threat, the radical reduction of the capelin fisheries by fishing fleets, the puffins have no defense whatsoever. And that, says a specialist quoted by Line, "doesn't bode well" for the puffin and other denizens of the northern seas.

## The Secrets of Baby Talk

"Phases in the Child's Development of Language" by John L. Locke, in *American Scientist* (Sept.-Oct. 1994), P.O. Box 13975, Research Triangle Park, N.C. 27709.

When baby utters his first "mama" at age one, adults exult that he has finally begun learning to speak. But his lessons in language began long before. Even in the womb, the infant's neural and vocal senses are being actively developed, writes Locke, director of the neurolinguistics laboratory at Massachusetts General Hospital in Boston.

Most theories of language assume that in-

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fants are motivated to talk by a desire to convey information. But Locke and other researchers believe that a thirst for social and emotional interaction is responsible, bred by a mother-infant bond that has its origins before birth. French researchers found, for example, that by the time they were only four days old, babies born of French-speaking mothers preferred the sound of French to Russian. Between mother and child flows a constant exchange of emotion conveyed by verbal and facial expressions: the baby smiles, coos, and eventually talks to get the mother's attention. Language "piggybacks" on this channel.

Locke believes that language and emotion are literally bound together by biology during the first years of life. In adults, speech and certain analytical functions are governed by the left hemisphere of the brain, while emotion is largely the province of the right. But Locke and others have found that the right hemisphere plays an important role in language during the first three to seven years of life. One sign: in the act of speaking, the right side of an adult's mouth tends to open first, because motor control of the right side of the body and control of speech are both vested in the left hemisphere of the brain. But in young children, both sides of the mouth open at the same time. Apparently, in them the right side of the brain, which controls the left side of the mouth, also houses speech centers.

According to Locke, language develops in four phases. During the first, babbling is the main form of vocalization. The fact that even deaf infants babble is one piece of evidence that biology rather than a desire to imitate is responsible. Biology also seems to dictate the production of certain universal sounds. Locke discovered that in nearly every language, the "m" in mama is present early on. Only later in a child's babbling stage do sounds that are rare or unique to his language, such as the "r" in rabbit, appear. Yet biology is not everything. When an infant talks on a toy telephone, Locke notes, he "babbles, pauses, babbles, pauses again," seeking to secure a social bond by acting and sounding like the adult he sees the most.

Around the second birthday, phase two begins: children begin stocking up on vocabu-

lary. The right hemisphere still has a powerful role in speech, so while toddlers can parrot adults, they cannot form complex thoughts.

In phase three (between 20 and 36 months), children say memorably cute things like "We goed to the store" and "I saw some mouses." The errors occur because the children are beginning to learn—and to misapply—the rules of language. The left hemisphere of the brain is asserting greater control over language.

The next stage is integration, or, in lay terms, learning the ropes of language. And after that the real babbling begins.

## Wasted Efforts

"Road to Nowhere" by Herbert Inhaber and Harry Saunders, in *The Sciences* (Nov.–Dec. 1994), 2 East 63rd St., New York, N.Y. 10021.

Americans don't agree on many things, but since the 1973 Arab oil embargo, most have viewed efforts to increase energy efficiency as a good thing. What better way to reduce dependence on foreign oil and to conserve precious resources for the future? Inhaber, a scientist at the Westinghouse Savannah River Company in Aiken, S.C., and Saunders, director of the San Francisco Bay office of Decision and Risk Analysis, see a flaw: the assumption that increased energy efficiency leads to lower energy consumption.

Consider the automobile. Throughout the 1950s and '60s, the average U.S. car got no more than 14.5 miles to the gallon. After the energy crisis of the mid-'70s, government regulation and rising gas prices prompted automakers to do better. By 1989, average mileage had jumped to 20.5 miles per gallon. The result? "Between 1973 and 1992," Inhaber and Saunders write, "the total gasoline supplied to American consumers hovered around seven million barrels a day, plus or minus perhaps five percent." With more-fuel-efficient cars, Americans drove more. They collectively logged 62 percent more highway miles in 1992 than they did in 1975, and bought 75 percent more new vehicles.

Efforts by public utilities to encourage customers to use energy-efficient lightbulbs, insu-