BIOLOGY

Self and non-self by smell

An individual's particular scent depends on genetics, as well as on diet and health. Researchers at Memorial Sloan-Kettering Cancer Center in New York recently discovered mouse genes associated with the production of odors distinguishable by mice. The genes are in a small region of one chromosome — a region previously recognized for its involvement in the mouse immune response. Although the researchers do not yet know whether the scent and the immune response are governed by the same genes, the association is provocative. Immunity and olfaction are the two most impressive examples of biological ability to distinguish chemical structures, so they may share a mechanism.

Scent discrimination was investigated with a Y-maze, Kunio Yamazaki told the recent Symposium on Chemical Signals in Vertebrates and Aquatic Animals held in Syracuse. The maze's two arms could be differentially scented by air currents passed through odor chambers containing genetically different mice. Four mice were trained first to distinguish between the odors of juniper and cinnamon, next between the smells of two unrelated strains of mice. Finally, the mice were taught to distinguish between the odors of mice of closely related inbred strains, differing only in the immunity controlling region (the major histocompatibility complex — MHC).

The mice learned not only to choose between living mice in the odor chambers, but also between the odor of urine from mice of different genetic types. This finding confirms that odor is the relevant clue, rather than some undetected communication, like an ultrasonic whistle, between the live mice.

Yamazaki and Edward A. Boyse and collaborators reason that the genes contributing to individual scents may influence reproduction and thus be a crucial factor in the fitness of a species. In breeding tests, male mice tend to select females of one of the MHC genetic types over females of another type. Usually the bias is toward matings of different genetic types. Because the MHC genes also are involved with immune response, Yamazaki speculates that offspring of genetically different parents have a wider-ranging, more effective immunity.

Another reproductive involvement of scent is the blocking of early pregnancies. A pregnant mouse may abort before the embryo implants if she is exposed to a strange male (or his urine). Mice of different inbred strains differ in their ability to block pregnancies or in their susceptibility to blocking. Yamazaki and co-workers have preliminary data indicating that the MHC genes may produce the scent involved.

Ostriches egg on their own

New complexities in cooperative breeding have been uncovered by a study of wild ostriches in East Africa. When it comes to incubating communal nests, the situation is no utopian one-for-all and all-for-one. One "major" ostrich hen, helped by the male, guards and incubates the eggs of two to seven others. The nest may contain up to 40 eggs, but the ostrich can only keep about 20 warm. So the major hen pushes away the extra eggs — and the abandoned eggs are seldom her own.

Brian C. R. Bertram of King's College in Cambridge, England, numbered, weighed, measured, described and photographed eggs in ostrich nests. He reports in the May 17 NATURE that among 80 eggs in three nests, 24 were doomed to perish by being pushed out of the nests' centers. Only one of those doomed eggs belonged to the major hen responsible. Each minor hen that laid more than two eggs had some incubated and some pushed out of the nest's center. Egg size may help the major hen identify her own eggs, but it does not explain how she chooses which among the other eggs to exclude. Bertram suggests that the extra eggs buffer the major hen's eggs against predation.

SCIENCE & SOCIETY

Mary-Sherman Willis reports from Washington at the AAAS Colloquium on Research and Development Policy

R&D and supremacy

It is evident from this meeting that while scientific government agencies support U.S. involvement in international science and technology, Congress does not. But nearly everyone, for reasons of security or status, worries about the United States' alleged slip in technological superiority over industrialized and developing nations. Citing figures from an AAAS report, for example, speakers pointed to the 5 percent growth of West German research and development since 1975, compared with a 2 percent drop in U.S. R&D.

Thomas R. Pickering, Assistant Secretary of State, Elliot Richardson, U.S. Ambassador at Large, and Charles S. Dennison, executive director of the Council on Science and Technology for Development, stressed the long-term importance of global cooperation in R&D. While 92 percent of the world's R&D takes place in industrialized nations, 75 percent of the world's population lives in developing nations, which have progressed rapidly in the past 10 years, Dennison said. Richardson called it the fastest moving area of R&D, and all three urged the establishment of an international institution to promote technological collaboration.

But even as they spoke, Title 2 of S588, a Senate foreign assistance bill providing for just such an institution, was struck down on the floor of the Senate. "It's a sign of the times," said Pickering, noting a "strong effort in the Congress to remove support for international [technological] cooperation," attracted as it is to short-term solutions.

The camel's nose under the tent

For half an hour Jordan Baruch, Department of Commerce Assistant Secretary for Science and Technology, tantalized his audience with what he called "a set of non-remarks" about his department's newly completed report on U.S. government options to increase the rate of U.S. industrial innovaton. Authorized by President Jimmy Carter last year and presented to the White House last week, the report will not be released to the public until it passes through the Office of Management and Budget, the domestic policy staff, the Office of Science and Technology Policy, the Council of Economic Advisors and several cabinet members. "I don't know what the report is going to look like by the time it gets to the President," he said.

But Baruch revealed some details of the report as he knows it. Of 150 recommendations supplied by representatives of industry, labor, academia and public interest groups, only 25 of the most "politically do-able ... [that] could be shown to have an impact on the innovation process" were chosen.

Two of the strategies recommended to the President concern filling the gaps in technical and market information. A "particularly important" section concerns small businesses — "the fount of most of the radical innovations that start new industries and provide new jobs," Baruch said. Another section "deals with what government can do less of, or differently"; what it does "that in fact inhibits innovation ... a very tough section." Another concerns the unwieldy U.S. patent system, its cost to the public and the restraints it places on innovation. The last section discusses labor and industrial innovations — how new production processes affect individual employment.

The recommendations test well against an investment model indicating whether a company could or would promote new methods or ideas, given the recommended government supports of resources and incentives, Baruch said. But he emphasized that this is only the beginning of government interest in stimulating innovation, and referred to an old Arab proverb: "If the camel once gets his nose in the tent, his body will soon follow."