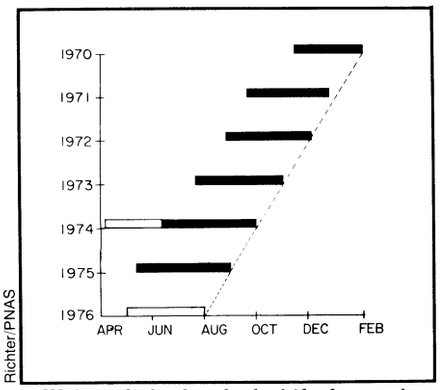
Chipmunks scamper to annual clock

The biological literature is replete with elegant studies of rhythms in living organisms. Most of the biological "clocks" explored to date, however, have been daily, monthly or seasonal. Now a yearly clock has also been identified — in chipmunks — by Curt P. Richter of the Johns Hopkins Medical School in Baltimore. This is the first "clear demonstration under experimentally controlled conditions of a yearly clock that actually measures phases of activity followed by phases of total inactivity," Richter writes in the July PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

Richter's first experiment involved a chipmunk which he trapped, kept in a cage for a year, then blinded by severing its optic nerves. Blinding is a well established method of revealing biological clocks that are entrained (set) by light. During the next seven years Richter saw some remarkable consistencies in the chipmunk's activities. It became inactive from 90 to 110 days each year, and this cycle moved earlier each year with such regularity that the seven cycles closely followed a straight line on a graph (see illustration). Onsets of inactive periods occurred with almost the same regularity. This finding documented the existence of a yearly activity cycle, which is kept running on time via light arriving into the brain through the optic nerves.

But would nonblinded chipmunks also show this yearly activity cycle? Richter attempted to find out. He trapped nine chipmunks and studied their behavior. Duration of their inactive periods ranged from 89 to 128 days — similar to the blinded chipmunk's 90-to-110 day inactive periods — also revealing a yearly clock. These inactive periods generally started in November and ended in March and, in fact, kept time with such a high degree of accuracy that one could predict similar dates of retreat in the fall and arousal in spring. Richter also found that the way the animals kept their activity clocks running on time was to expose themselves to just the right amount of light. During the active phase of the animals' yearly clock, activity during the light period tended to occur only during the quiet hours in the lab. During much or all of the rest of the light period, the chipmunks were curled up with their heads and eyes covered by the rest of their bodies. Richter made still another finding: If chipmunks exposed themselves to too much light, they lost their annual activity clock.

So chipmunks have a yearly activity clock that can be shifted by blinding (total absence of light), kept on time by exposure to limited light and abolished by exposure to too much light. □



Without light the clock shifts forward.

Nitrite solos as cancer hazard

A new concern about nitrite surfaced in a joint statement of the Department of Agriculture and the Food and Drug Administration. Widely used to preserve, color and flavor meats, poultry and fish, the additive may increase the incidence of human cancer. For years scientists have known that nitrites can combine with other chemicals in foods or in the body to form nitrosamines, which cause cancer in test animals. However, a recent report from Paul M. Newberne of Massachusetts Institute of Technology suggests nitrites themselves can be detrimental. In his experiments, rats receiving nitrites in their diet developed significantly more cancers of the lymphatic system than did rats receiving no nitrites. According to Robert M. Schaffner of the FDA, this effect differs from the reaction to nitrosamines. Nitrosamines cause tumors in different organs, not in the lymphatic system. Furthermore, the nitrite appears to promote tumors, rather than initiate them as nitrosamines do. Newberne says the data's biological significance is unclear. "There are suggestions however of sufficient magnitude and the study used sufficient animals to raise questions about the widespread use of relatively high concentrations in our food supply," he concludes.

The FDA-USDA statement says the agencies are now balancing the risks of the potential cancer hazard against the benefit of processing, transporting and storing nitrite-containing food without risk of botulism. Alternative processes that can prevent botulinum toxins from contaminating food take more care and are more expensive. Consumer activists charge the FDA is violating the Delaney clause by not banning nitrite addition. According to the USDA-FDA statement, cured foods comprise 20 percent of average dietary exposure to nitrites. The rest comes from conversion of other nitrogen-containing compounds by bacteria in the mouth and digestive tract. □

Four mathematicians get Fields Medals

Four young mathematicians, two of them Americans, received the prestigious Fields Medals at the opening ceremony on August 15 of the Eighteenth International Congress of Mathematicians in Helsinki, Finland. Regarded as the equivalent for mathematics of the Nobel Prizes, the Fields Medals are awarded every four years to mathematicians under the age of 40 "in recognition of work already done and as encouragement for further achievement."

The four 1978 awards went to Daniel Quillen of the Massachusetts Institute of Technology, Charles Fefferman of Princeton University, Pierre Deligne of the Institut des Hautes Etudes Scientifiques in France and G. A. Margulis of the Soviet Union. These awards bring to a total of 24 the number of Fields Medals awarded since the prize was established in 1932 by a bequest from the Canadian mathematician John Charles Fields.

Quillen was cited in his award as being the prime architect of a new research area called "algebraic K theory" that has successfully employed geometric and topological tools to solve major problems in algebra. In 1976 Quillen solved the famous problem posed 20 years earlier by the 1954 Fields medalist Jean Pierre Serre concerning the structure of certain abstract mathematical spaces.

Fefferman, winner in 1976 of the National Science Foundation's Alan T. Waterman award, was cited for several innovations that have revived the study of classical analysis. Fefferman's chief contribution has been to find correct higher dimensional generalizations of low dimensional theorems. His methods have led to the solutions of many old problems long thought to be unsolvable.

The Belgian mathematician, Deligne, is best known for his 1974 solution of three famous problems called the Weil conjectures that relate on a very esoteric level certain properties of prime numbers with the solution of equations in finite systems of arithmetic. These problems are immense generalizations of patterns suggested by C. F. Gauss in his 19th century classic *Disquisitiones Arithmeticae.*

Margulis received his Fields Medal for innovative analysis of objects, called Lie groups, that are of fundamental importance in the study of differential equations. These groups relate algebraic, geometric and analytic structures in a simple mathematical object and have proved, as very few other mathematical concepts have, to be of enormous importance to contemporary science. Besides their notable use in astrophysics and chemistry, Lie groups are playing a key role in current work on unified field theories in high energy particle physics. □