NUTRITION

Storing Crayfish

THE belief that frozen crayfish tails are best stored uncooked has been confirmed by the Division of Food Preservation of the Commonwealth Scientific and Industrial Research Organization of Australia. Tests of the effects of storage at different temperatures have shown that the ice crystals that form in frozen samples of Japanese crayfish (*Panulirus japonica*) stored at −30° C are smaller than those formed in samples stored at −20° C, and grow more slowly, chiefly between the cells. Ice crystals are both intra and intercellular in samples stored at the higher temperature, and so cause more damage to the tissues of the crayfish. Furthermore, the extractability of myosin in molar potassium chloride decreases more rapidly in frozen samples stored for between three and six months at −20° C as opposed to −30° C. If these findings, described in the division's latest annual report, are repeated with local Australian species, the crayfish industry will probably find it advisable to store its product at −30° C instead of a higher temperature, if the material is to be kept for three months or more.

Abalone was another delicacy under scrutiny last year. A shipment of canned abalone which had been rejected in Japan seemed to have "foam rubber" centres. There was no bacterial contamination in the cans, and the trouble was evidently caused by mishandling and delays before canning. In the interests of the abalone industry the division proposes to investigate the causes of this and related problems.

Some boiled or raw mullet (*Mugil cephalus*) and a few other fish such as bream (*Mylio australia*) have a strong taste of kerosene with a lingering after-taste, which can, however, be removed by freeze drying or baking the fish at 260° C. The factor responsible for the taste is lipid soluble and can be extracted by conventional techniques. Oil from tainted fish seems to have a greater content of C18 fatty acids and less C22 unsaturated acids than that from untainted fish. The cause is not thought to be β-propiothetin, which is responsible for a taste of petroleum in chum salmon after decomposing to dimethyl sulphoxide when the fish is heated.

NUCLEAR PHYSICS

New Subnuclear Particles

THE efforts being made to find a conceptual order for the particles of the subnuclear world have received a useful boost in the discovery of four new particles known as Xi-star resonances. Preliminary calculations on the new resonances, which belong to the heaviest class of nuclear particles known as baryons, show that they may well fit into the symmetry scheme called *SU*3 which many believe to be the guiding light in the subnuclear cosmos.

Three of the particles were found in a prolonged hydrogen bubble chamber experiment using the giant proton accelerator at Brookhaven, New York (*Phys. Rev. Lett.*, **22**, 2, 79; 1969). The fourth particle and a confirmation of one of the other three were found in a similar experiment using the larger of the two accelerators at CERN, Geneva (*Phys. Lett.*, **286**, 6, 439; 1969). The skill and perseverance needed to extract the evidence for the existence of the particles can be assessed by the fact that only 150 of the 700,000 bubble chamber photographs taken during the Brookhaven experiment contained the incriminating clues.

How do these new particles fit into the current picture of fundamental particles? Indeed, should the current picture be ascribed more to the impressionist school than to the firm terrain of exact representation? The extent to which the resonances slot into the *SU*3 symmetry scheme, based as it is on the postulation of three fundamental particles known as n, p and λ quarks, gives hope that *SU*3 may yet prove to be the key to understanding subnuclear matter.

The three quarks, characterized by non-integer charges (in units of the electron's charge), half-integer spin and by strangeness quantum numbers of 0, 0, and −1, can combine together to form baryons. By interchanging one quark for another it is possible to set up groups of baryon states all with the same spin and parity, and one of the lowest energy groups is the octet containing the unenergized Xi particles. The splitting in the octet is caused by the strangeness interaction, in the same way that the splitting in the hydrogen molecule triplet is due to spin.

The new particles all have strangeness quantum number −2, and masses of 1,815, 2,030, 2,430 and 2,500 MeV. The Brookhaven teams suggest that the first and second of these are members of *SU*3 octets whose spin and parity are designated respectively by $\frac{3}{2}^-$ and $\frac{5}{2}^+$. Baryons of strangeness −2 have until now been a rare commodity, and the fact that the energized Xi states can still fit into the *SU*3 is encouraging.

There are now more than 200 such particles, most of which are known to be energized states of more basic particles. The general motivation in looking for more particles is to see whether their masses, spin and parity allow them to be fitted into the predicted octets and decaplets of *SU*3. An untapped wealth of Xi states is thought to be awaiting measurement, one of the inhibiting factors being the difficulty in tracking those of higher mass because of their very short lifetimes.

PULSARS

Astronomers see the Light

from our Astronomy Correspondent

AFTER a year of false alarms, optical astronomers have at last picked up light flashes from one of the pulsars, not surprisingly the pulsar in the Crab nebula which already has a specification distinguishing it from the other pulsars so far known. First news of the flashes reached observatories by the telegram service from the Smithsonian Astrophysical Observatory, Cambridge, Massachusetts, in a message which seems to have come direct from the bureau's chief. The discovery comes almost a year after the first announcement of pulsating radio sources by the Cambridge group, and follows months of fruitless searches when optical astronomers would have been happy to detect even the faintest aggregation of silver grains on their plates at the radio positions. But as the radio measurements became steadily more precise, the error rectangles closed in on obstinately blank parts of the sky or, equally disheartening, on areas jammed with stars.