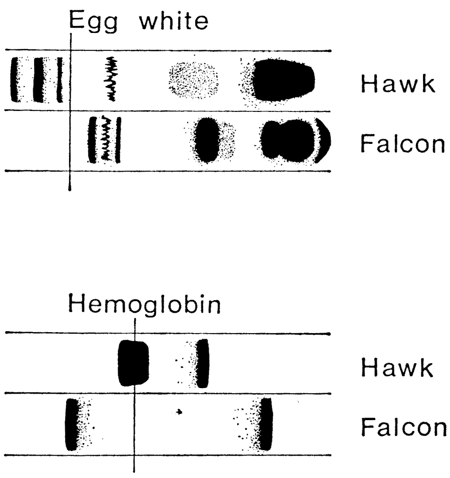
But recognizing the value of approaching the problem through protein studies, scientists have resorted to protein analysis by a method called electrophoresis. In this process proteins are indentified according to the visual patterns they make when suspended in a liquid under the influence of an applied electric field. Useful as the method is, it is not precise and gives no detailed information on protein structure — hence, no proof. The protein machine will do away with this imprecision.

Following Dr. Edman's diagrams, instrument makers at the federally supported Oak Ridge National Laboratory




Jon Ahlquist

*Electrophoresis: imprecise image.*

in Tennessee and at a private firm in Chicago are working out production problems on the machine.

Amino acid molecules are split off proteins in a series of chemical reactions by various reagents and solvents that have to be fed into the system at just the right time and in just the right amounts. Although Dr. Edman's machine unquestionably works, it is a hand-built instrument that engineers believe can be simplified and perfected before going into mass production at $22,500 apiece.

One of the scientists consulting on this project — Dr. Emanuel Margoliash of Abbott Laboratories, Chicago — points out that the machine's potential extends beyond the laboratories of evolutionists. By speeding protein analysis, it can lead to the synthesis of proteins for treatment of disease. So far, insulin, a short molecule only 51 amino acids long, is the only synthetically available protein.

**Actually,** complete blueprints have been mapped for only a very few proteins–insulin, myoglobin, ribonuclease and lysozyme — primarily because the determination of amino acid sequences is so time-consuming. To get an accurate three-dimensional model of a protein, scientists first find the sequence and then use X-ray crystallography to learn how the long-chain molecule twists itself into a compact protein.

Rockefeller University's Dr. Stanford Moore, who spent 10 years unraveling the 124 amino acids in ribonuclease—a protein that deactivates RNA or ribonucleic acid—predicts ribonuclease synthesis within the year.

Dr. David Harker of Roswell Park Memorial Institute, Buffalo, who did the X-ray crystallography work on ribonuclease, suggests that structural defects in critical proteins including ribonuclease may have a relationship to cancer. If so, structure analysis of proteins from both normal and diseased cells will shed a great deal of light on the disease.

Geneticists, too, are among scientists lining up for the first protein sequenators. They, like evolutionists, will use amino acid sequence as a route back to genetic information coded in genes or DNA (deoxyribonucleic acid). If they can both spot the defects leading to inherited diseases and synthesize proteins to replace defective ones, they'll be able to regulate, and perhaps eventually to eliminate, these disorders. ◇

AN AAAS REPORT

## After 10 Years: Thyroid Damage

Iodine is an essential element for the proper operation of the thyroid, a gland which produces growth-regulating hormones. But when the iodine absorbed by the thyroid is radioactive I-131—a product of nuclear fission—damage to the gland from beta radiation can take place.

In large quantities, I-131 radiation destroys the thyroid tissue; it is used medically for this purpose in cases of overactive thyroid. In lesser quantities, the effect of the radiation is quite undetermined, but the evidence suggests that cell chromosomes are damaged, and the reproduction of cells in the gland is reduced.

**Recent studies** are filling in the gaps in knowledge about the effects of iodine fallout from nuclear tests, showing that heavy exposure definitely causes thyroid damage. But the effect of lesser exposure remains in doubt.

Until 1962, iodine 131 fallout was dismissed as a threat to health because it lasts such a short time: its half-life is eight days. At that time, venting from an underground test in Nevada produced sizable quantities of the isotope, which showed up in local milk supplies. If such a small accident could cause significant pollution, earlier tests, it was argued, could have had a more serious effect.

Two areas which received large accidental doses of fallout in the early days of testing were the Marshall Islands atoll of Rongelap, which was exposed in March 1954, and Washington County, Utah, which received considerable fallout from a test in May 1953.

The Rongelap islanders, according to a study reported at the AAAS meeting in New York, are now, more than a decade after exposure, developing nodules on their thyroid glands, as well as signs of growth retardation associated with abnormal thyroid operation. According to Dr. Robert A. Conard of the medical department of Brookhaven National Laboratory, the thyroid abnormalities clearly come from the radiation exposure, since they showed up only in islanders who were present during the exposure, and not to nearby inhabitants who received less fallout.

**Results** from a study of 1,000 Utah children exposed in Washington County, also reported at the AAAS meeting, were negative: no more thyroid abnormalities were detected among them than among a similar number of Arizona children who hadn't been exposed.

But, says Dr. Edward S. Weiss of the U.S. Public Health Service, the question of delayed reaction still hasn't been settled. If the Rongelap islanders, who received about 1,200 rads of I-131 radiation, developed symptoms only after a decade, the Utah children might take longer. According to studies by Dr. Arthur R. Tamplin of the University of California's Lawrence Radiation Laboratory, the Utah exposure was on the order of 120 rads.

One school of thought holds that a threshold level of exposure would have to be reached before any serious effect would ever develop. But another approach, based on the long-term effect of damage to cell reproduction mechanisms, indicates that even relatively small amounts of the radioactive element could have longterm effect.

**The possibilities** of studying the Utah children won't be good much longer, says Dr. Weiss, since most of them will soon be getting out of high school and scattering. And separating actual abnormalities from temporary changes can be a long process: up to two years in some cases.

So the ultimate effects of small I-131 dosage are not likely to be learned. As an aftermath of the 1962 scare, the Government is still taking particular precautions to avoid exposure, as evidenced by the restriction of tests such as the Cabriolet (SN: 12/19/67) cratering experiment to the winter season when possible radioactivity won't contaminate grazing areas. ◇