

The synthesis of ribonuclease opens the door not only to further enzyme work but also to synthesis of hormones, a class of chemicals structurally like proteins in many respects.

"Human growth hormone, only 155 amino acids long, has dramatic effects in pituitary dwarfism, for example," Dr. Denkwalter observes. "Someone should make it."

HOLOCAUST PREVENTION

Keeping tabs on quakes

U.S. cities are growing, population is expanding, nuclear power plants are multiplying, oil refineries are enlarging, fuel tanks are proliferating and underground pipelines interlace the country.

But if a strong earthquake were to hit, these same hallmarks of civilization could create holocaust.

And within the next 30 years, the Federal Council for Science and Technology predicts, the country will suffer one great earthquake, a few severe ones and many moderate ones. Dr. William T. Pecora, director of the U.S. Geological Survey of the Department of the Interior, sees the country in a race against time. To Dr. Pecora, the rate of acquisition of knowledge about earthquakes is of vital importance if we are to win.

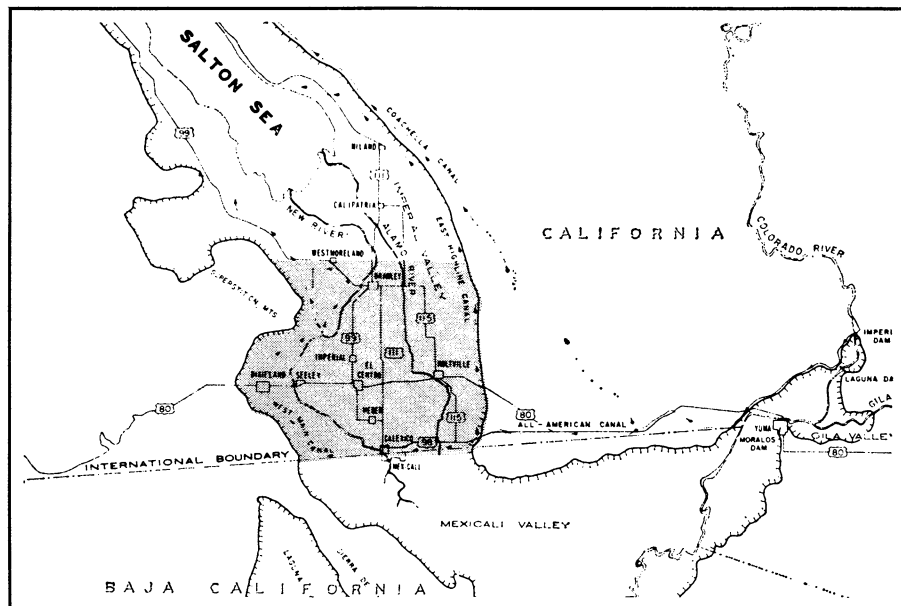
To reduce the expected hundreds or thousands of deaths and the billions of dollars in property damage, an ad hoc group of the council, chaired by Dr. Pecora, proposes that the White House establish a national earthquake research program to find ways to predict not only where but when quakes will strike, how structures should be designed and constructed to ward off the shock, and even what can be done to prevent a quake by relieving stress in the bedrock. The cost of the 10-year program would be about \$220 million.

The main obstacle to an effective earthquake program today is not instrument development or lack of scientific manpower, but the money to deploy existing instrumentation and to support associated analyses and research activities. Dr. John DeNoyer, assistant director of research at the U.S. Geological Survey, says, "There are always improvements to be made in instruments, but the present need is for installation of available equipment and research programs to use the collected data."

The largest share of the money, \$80 million, would be allocated for development, installation, operation and management of seismic instruments in earthquake zones. The rest would be divided among research in geology and geophysics, the physical nature of earthquakes, and engineering techniques for earthquake protection and prevention.

IMPERIAL VALLEY

Geothermal steam looks better



Geothermal steam fields (shaded area) in Southern California.

Buried under some 2,000 square miles of the Imperial Valley are vast underground reservoirs of extremely hot water (500 to 700 degrees F.) that could supply all the pure water and electric power needs of nearly all of southern California for several decades. The Imperial Valley, extending 70 miles north of the Mexican border and 30 to 40 miles wide, is one vast potential steam field.

Basically, all that's required to make it productive is to drill wells, thereby unlocking the geothermal energy of the water, which would be released in the form of steam. The steam in turn could drive generators to produce electric power. Or it could be condensed into distilled water for agriculture and drinking. The heat from the steam could also be used indirectly to make more distilled water by applying it to seawater, one pound of steam producing 10 pounds of water.

Studies are now being conducted by the University of California at Riverside under the direction of Dr. Robert W. Rex to map out the potential sites for geothermal wells. In a report to be released this month, Dr. Rex will announce the discovery of two new potential sites in the U.S. portion of the Imperial Valley.

The exceptional feature of these fields is their low salinity. High salt content is the spoiler for the wells. If the brine is too salty—20 to 30 percent—it cannot be used for water. The newly discovered well sites contain two to three percent salt, the same amount found in Mexican wells.

To obtain distilled water, a well

would be drilled. This releases the pressure, and the extremely hot water flashes into steam. As if in a giant percolator, the water boils at the bottom of the well and sends up steam and slugs of water which are separated by a centrifugal separator, the steam coming out one pipe, the brine coming out another. The hot brine would be carried off to a succession of chambers, each at a lower pressure than the one before to compensate for the lower temperature and still make steam.

The flow rate from the most productive Mexican well, near Mexicali, is two million pounds of steam and brine per hour, or 140,000 barrels a day, the highest flow rate of any well in the world.

There is enough potential energy in the steam fields to end the squabble between California and Arizona over rights to the Colorado River, their common boundary and the major source of water and power in that area (SN: 2/11/67, p. 135). The dispute grew out of historical rights that governed claims to the Colorado River. The result is that today the Imperial Valley alone is entitled to one-third of its share of the river's water. However, if the potential of the steam fields in the Imperial Valley—a truck gardener's paradise—could be realized economically, California would no longer need all of its share of the river.

"The economics of the situation are appealing," says Dr. Rex. "The cost of heat for electricity and desalination would run from one to two cents per one million British Thermal Units, whereas heat from nuclear sources is