Greek cities. At its height, the city must have covered an area of several square kilometers. According to various ancient sources the city had a population of 100,000 or even 300,000 people. That was bigger than Athens, which reached its zenith under Pericles half a century after the destruction of Sybaris.

Now, however, only about 20 structures can be located, all of them in an area only a quarter of a kilometer square. The rest of the buildings were probably destroyed by water, if not Crotoniates.

Archaeologists are excited by one building 98 feet long and another possible structure 300 feet long. The latter could conceivably be the ruins of a temple like those at Paestum on Italy's west coast. Paestum was settled by Sybarites and its three temples "are among the greatest Greek temples in existence," says Orville H. Bullitt, a Philadelphia banker and archaeological scholar who supplied a major part of the expedition's backing.

"There may be columns and statues lying around," says Bullitt. "Sybaris was the greatest Greek city of the 6th century B.C. It is possible that some of its riches are still there." Dr. Rainey notes that huge, handsome terra cotta facades on public buildings can be expected from this period.

Some 80 ancient authors have written of Sybaris, usually as an example to be avoided. If the old moralists can be believed, Sybarites became slaves to their bellies and lovers of luxury.

"It would have been lovely to have been a rich Sybarite," says Bullitt. "They did absolutely nothing. They were utterly decadent and produced no great men at all."

Sybaris entered decline when, following civil strife, a group of Sybarites fled to Croton, where the Greek philosopher Pythagorus had considerable influence. Sybaris demanded that Croton give up the exiles, but that city, supposedly persuaded by Pythagorus, refused. War followed.

According to the dancing horse tale, the Crotoniates won the battle by striking up a dance tune for the Sybarite horses. The steeds danced away from the field of battle, taking their riders with them.

On the subject of the sinking of Sybaris, the ancients are strangely silent. Only one mentions its submergence, explaining that Crotoniates diverted a river over the city. Museum authorities, however, believe this would have been impossible and that an earthquake caused Sybaris to sink below sea level. "I don't think any city is buried as deeply as this," says Dr. Rainey. That the ancient writers fail to mention this "is the strangest thing of all."

QUIET DEATH

Protecting the uranium miner

Death enters a uranium mine quietly, through the walls. It moves through the rock in the form of radon gas. Unperceived, it visits the work crew each day until, after a number of years, one miner in 50 learns that he has fatal lung cancer. From 1950 to 1967, lung cancer killed 62 miners of a sample of 3,000: a fifth of the nation's total. That was six times the number expected, even in this high risk group, and far beyond the proportions in the general population.

Concern over the problem has been rising ever since, and on Jan. 1, unless President Johnson intervenes, a new minimum limit for radiation in mines with contracts from the Atomic Energy Commission automatically goes into effect. These AEC-contract mines amount to 75 percent of the total and hire an even larger proportion of the miners. Those miners in other digs, however, remain unprotected, except for state requirements.

The question before the President is one of degrees of safety; should he decide that the limit of three-tenths of a working level recommended to him by the Department of Labor is unnecessarily restrictive, he has the power to adopt a less stringent limit.

His decision will be based—at least in part—on a confidential report prepared by the Federal Radiation Council. Dr. Paul Tompkins, executive director of the FRC, set up to advise the President on radiation matters and composed of cabinet members and the AEC chairman, favors the present limit of one working level, which his organization originally recommended in June 1967, based on U.S. Public Health Service findings. He regards it as a more practical limit. "I chose the Public Health Service standard because it was reachable," Dr. Tompkins says. "I don't think the three-tenths is. One working level standard represented a reasonable risk and should not be unduly restrictive on the mining industry." In 1966, the last year for which there are figures, exposures averaged 2.1 working levels—with only the best mines reaching that figure or below.

The three-tenths level came about last year, when Secretary of Labor W. Willard Wirtz, impressed by reports of lung cancer among uranium miners, set a temporary limit of one working level to be automatically superseded by a three-tenths level on Jan. 1, 1969. Since then the Department of Labor has been battling the AEC and uranium mining companies to determine the safe limits for uranium mines.

One working level is equivalent to one ten-millionth of a microcurie of radon per cubic centimeter of air. A microcurie is one millionth of a curie, which is the equivalent of 37 billion disintegrations a second. Although these are relatively low levels of radiation, no one can agree on what are absolutely safe levels.

Dr. Robley D. Evans, professor of physics at the Massachusetts Institute of Technology, says the current one working level is safe; in fact, he maintains that anywhere from one to three is safe. Based on 35 years of research on radiation damage to humans, Dr. Evans concludes that there is a practical threshold below which the body can repair itself.

From five separate kinds of measurements of human responses to alpha radiation, he concludes that this threshold is not violated at the one working level and that the response at that level is negligible. Dr. Evans also states that one working level is not technologically attainable in all parts of every mine, let alone three-tenths.

Roy Stott, supervising mining engineer for the U.S. Bureau of Mines, sides with Dr. Evans on the unattainability of the three-tenths level. "I am confident that we can get to one working level, but I have a very great question in my mind about three-tenths."

On the other hand, Dr. Karl Z. Morgan of the health physics division of the Oak Ridge National Laboratory says, "The existence of a threshold dose below which the incidence of radiation-induced cancer is zero has not been proven." He cites a report to the Health Physics Society last June which found that miners subjected to one working level for 10 years showed an abnormally high incidence of lung cancer. Dr. Morgan feels that three-tenths of a working level is technologically feasible.

Dr. Walter Snyder, assistant director of the Oak Ridge health physics division, also feels that three-tenths is possible. He adds that there could still be a question though as to whether radon decay products or radon products in combination with other factors such as smoking, dust or dampness cause biological damage. The influence of other factors must be taken into account in setting a safe limit, he says.

Actually it is the products of radon decay rather than the radon itself that cause the damage. These radon daughters, as they are called, are isotopes of polonium, lead and bismuth. Of this group, polonium 214 and 218 are the principal culprits.

The main method of protection now

is ventilation. That method works up to a point, but as a mine grows and becomes more winding and complex, ventilating to prevent radon build-up becomes less effective. Respirators or masks, as a rule are not worn. They do keep out some of the radioactive particles, but the miners complain that they interfere with their work.

One area undergoing research is that of sealants. Films of latex and urethane foams are being applied to the areas already excavated to prevent the radon gas from leaking out of rock interstices.

Despite a reduction in the average working level over the years, the latest report by the National Research Council shows "a statistically significant increase in the lung cancer risk" for uranium miners. Although the study group acknowledges the role of a synergistic effect from cigarette smoking and although it makes no recommendations of safe levels, "it recognizes that decisions to safeguard the health of uranium miners must be made soon."

DESALTING

Giant plant cut back

Construction of the world's first large-scale combination nuclear power and desalting plant is going ahead in diminished form despite a recent setback. Originally foreseen as a 150 million gallon-a-day desalination plant on Bolsa Island, a man-made spit of land off the coast of California near Los Angeles, the final plant will be limited to 50 million gallons a day.

The original schedule called for construction to start this year, with initial operation in 1974 and full capacity in 1978. However, a pullout in September by three of the plant's main backers—the Los Angeles Department of Water and Power, the Southern California Edison Company and the San Diego Gas & Electric Company—has forced the Metropolitan Water District of Southern California to retrench. The pullout was prompted by rising costs resulting from inflation and changes in plant design.

Besides desalting capacity, power production is also threatened. Originally, the plant's capacity power was estimated at 1,800 megawatts. If none of the utilities return, MWD would be forced to run the power unit at a reduced output.

The district's hopes for the utilities' return are based on the desirability of the site, close to a huge metropolitan area, and the belief that the cost of producing nuclear power will stop rising.

Original cost estimates for the plant ran to $444 million; the new figure is $765 million. Last year Congress appropriated $72 million for the project.

The desalting will be accomplished by multistage flash evaporation, which has proven workable on a small scale. In the process heated seawater enters a chamber where reduced pressure causes a portion of it to flash into steam. The steam is condensed and the operation repeated on the rest of the brine in similar chambers at progressively lower pressures and temperatures.

HONG KONG STRAIN

Fifteen viruses plus

College campuses across the country closed for Christmas vacation a week early. Work absenteeism is high. Hospitals have asked visitors to stay at home.

The Hong Kong flu, as expected, has reached epidemic proportions in parts of the United States and its rampage is not likely to subside until midwinter. But the exotically named ailment is probably getting more than its share of the blame.

When a person comes down with a cold, or a fever, or chills he is likely to diagnose his disease as the Hong Kong flu but, public health officials declare, 16 varieties of flu viruses are going around and not everyone who gets sick has actually been hit by the new A2 viral strain first noticed in Hong Kong last summer. Unless physicians perform laboratory tests on flu patients to identify the infecting virus—and they aren't going to do that—it is impossible to distinguish one strain from another.

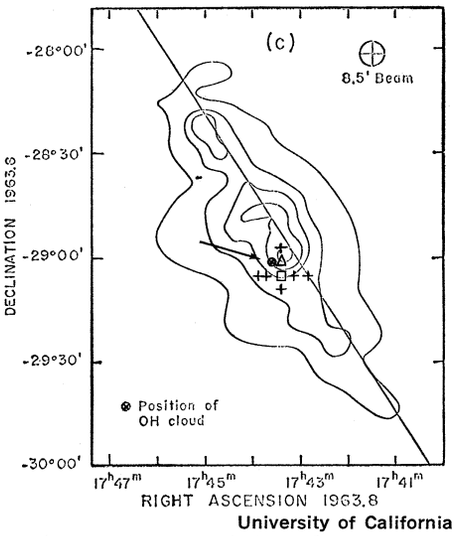
As of early this month, the U.S. Public Health Service had recorded 672 deaths attributable to the flu, and to pneumonia which often accompanies it, especially in the elderly and chronically ill (SN: 12/7, p. 570). However, officials at the National Communicable Disease Center in Atlanta caution that this figure represents only 196 "excess deaths." That is, the disease takes the lives of about 500 persons each winter, when influenza is ordinarily most prevalent.

Among healthy persons, U.S. Surgeon General William Stewart says, the new Hong Kong flu strain is no more dangerous than other types of influenza virus.

Since September, six major U.S. pharmaceutical houses have been working around the clock to produce a vaccine against the Hong Kong strain which is impervious to Asian flu vaccines that have been around since 1957 when the last major epidemic occurred. By January an estimated 20 million doses will be available with two million set aside for military use and the remaining 18 million hopefully reserved for high risk patients.

MOLECULAR ASTRONOMY

Ammonia between the stars



Ammonia toward the galactic core.

Researchers at the University of California in Berkeley have found molecules of ammonia in a turbulent but cool cloud of dust and gas located in the direction of Sagittarius. The region is in the direction of the center of the Milky Way galaxy, close to the position in which hydroxyl molecules were previously detected (SN: 8/17, p. 167).

The discovery of ammonia molecules in the direction of the dusty core of the Milky Way strengthens the theory that the grains in space are molecule factories generating the basic ingredients of life.

A strong source of infrared radiation (see p. 644) has also been found near both the hydroxyl and ammonia sources. Hydrogen is the most abundant material in the universe: it can combine with oxygen to form the hydroxyl molecule, with nitrogen to form ammonia and with carbon to form what is called simply the CH molecule.

Carbon, hydrogen, oxygen and nitrogen are essential ingredients of life as it is known on earth.

The diameter of the cloud, which cannot be photographed in visible light due to the obscuring dust, is a few light years. Its distance has not been determined, although the University of California group is working on the problem. The estimated density is about one molecule per liter, and the molecules were calculated to be at about 23 degrees K.

The ammonia molecules were detected using the new 20-foot radio telescope at the Hat Creek station of the university's Radio Astronomy Laboratory. The scientists are Dr. Charles H. Townes, Dr. David M. Rank, Dr. William J. Welch, Albert C. Cheung and Douglas D. Thornton.