Ancient city found in Sinai

Israeli archaeologists, working only a few miles from the military no man's land at the edge of occupied territories in northwestern Sinai, have excavated remains of an ancient city that served as a major trading link between Egypt and Palestine during the time of Christ. Their discoveries raise several questions about the history of the area and may illuminate a new phase of Jewish wandering that took place after the unsuccessful first- and second-century revolts against Rome.

Trade routes were established along the northern edge of the Sinai peninsula as early as 3000 B.C., when Egypt sought the advanced metal products of southern Palestine. Around the third century B.C., inhabitants of ancient Arabia, called the Nabateans, apparently captured a monopoly on trade along this portion of the Via Maris—the legendary "Road of the Sea" running along the Mediterranean from Egypt to Syria, over which passed a lively trade in spices, metals, textiles, wine and hashish. In an interview with some American journalists in Beersheba, Ben-Gurion University professor Eliezer D. Oren told of finding remains of some 800 settlements in the northern Sinai, including a Nabatean city he calls Kassrwit.

Buried among the drifting sand dunes about five miles southeast of the desert oasis of Katia, Kassrwit was located by scanning aerial photographs for irregularities in vegetation. The 75-acre city was discovered once before, by a French archaeologist in 1911, but little excavation followed and it was quickly lost again. The Israeli scientists have now uncovered large temples, extensive housing complexes, tombs, and suburban settlements extending to nearly two miles away.

As in their other, previously known communities, the Nabateans chose an eclectic combination of architectural elements for their buildings. In the central temple, a small inner room with wooden ceiling and Greek-style columns is surrounded by a larger court whose outer face is decorated with Egyptian motifs. Stone for the temples had to be carried several miles (the city was apparently built some distance from the main road for protection) and timber would have had to be imported from afar. In the living quarters, rich stores of everyday houseware were found, including examples of the thin, delicate pottery for which the Nabateans were famous. Among the tombs, the archaeologists uncovered 20 skeletons.

But what Oren calls "the most emotional find" was the discovery of a small clay lamp bearing the unmistakable imprint of a Menorah—the seven branched candelabrum associated since ancient times with Jewish worship. The discovery of this and other religious objects from around the third century A.D. suggests that Kassrwit and the trade route it controlled may have passed into Jewish hands after the Nabateans were defeated by the emperor Trajan in A.D. 106.

Clay lamp found at Kassrwit.

Photos: John H. Douglas

Oren holding picture of Nabatean temple.

Already for several years, the Middle East had been swept by revolution, and when Jewish communities in Egypt and elsewhere joined a revolt against Rome in A.D. 116, many members were driven out as part of the "Second Diaspora." A Jewish coin found during excavation bears the inscription, "Third Year Liberty to Zion." The implication—not yet proven—is that resettlement in places like Kassrwit eventually brought the Jews into the mainstream of commerce in the area.

Oren offers a tantalizing postscript to this theory in his article in the weekly Israeli paper *Bamachaneh*. Inscriptions from the 15th century A.D., found in nearby Katia, show that a thriving Jewish community existed there at that time. Even today members of a local nomadic tribe follow Jewish traditions and are considered Jews by their neighbors.

Next month, Oren returns to the Sinai in hopes of uncovering further evidence from Kassrwit while there is still time. He told interviewers that he expects not to be able to return to the site "in my lifetime" if it is turned over to the United Nations in the next round of negotiations. In addition, the natural conditions of the site are the "most hostile" he says he has ever encountered. Within less than a year, most of the archaeologists' excavations could again be covered by blowing sand. □

Magnesium: Control over cell processes?

Cell biologists, in general, study life functions on a highly detailed level. It is not uncommon for a researcher to spend years ambling along one metabolic pathway, watching the molecular travelers and searching in the biochemical thickets for routes of ingress and egress. This approach has provided all of the information on the labyrinthine biochemical pathway charts so often in evidence on laboratory walls—not to mention the collective understanding of life processes.

By focusing on individual pathways, however, it is possible to lose sight of the cell as an holistic, integrated unit that responds, as a unit, to control signals. Cell biologist Harry Rubin of the University of California at Berkeley has for several years been looking at the cell as an integrated unit, and has found what he thinks may be the coordinating control process for metabolism and growth in animal cells. It is the intracellular availability of magnesium, he reports in the September PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

Rubin explains that in a typical animal cell such as a fibroblast (a connective cell that makes collagen and matrix materials), a whole array of cell activities accelerate or decelerate in unison in response to certain control factors. These include population density, pH and certain hormones. The cell activities (transport and metabolism of sugars, synthesis of fats, proteins and nucleic acids, etc.) step up or step down coordinately, and do not, Rubin says, shut each other off in sequence. There must, therefore, be some common control mechanism that underlies the more obvious factors.

Rubin knew that the magnesium ion (Mg^{++}) is a necessary co-factor for several biochemical reactions, especially transphosphorylation reactions such as the transfer of phosphate to and from the energy storage molecules ADP and ATP. He tested the role of Mg^{++} in cellular control by reducing it in the fibroblast culture medium and by adding pyrophosphate, a substance that combines with Mg^{++} and prevents it from entering and reacting in the cell. He found that decreased availability of Mg^{++} led to a coordinate deceleration in cell functions, and that increased availability led to an acceleration.

That an inorganic ion might control growth and differentiation is not a totally new idea. But the magnesium theory is sufficiently different from other models of cellular control that Rubin foresees the need for a vigorous scientific defense. He is continuing his studies with a more detailed look at cell response to Mg^{++}, quantitative measurements of Mg^{++} and other ions (calcium, sodium and potassium) and the possible relationship of Mg^{++} to malignant transformations. □

Stimulating the brain to prevent pain

As James S. awakens, his arthritis is acting up again. He reaches for a battery-charged box on his bedside table, switches it on and places it near his chest. An electrical charge generated by the battery pack stimulates receivers implanted in his upper chest, and then runs along wires implanted under the skin of his neck and up into tiny electrodes implanted in his medial brain stem. Several minutes later his joints stop hurting, and he remains pain-free for the rest of the day. . . .

Sound like science fiction? Absolutely. Yet this method of pain relief is already a reality at several American medical centers. It has become so because of recent, dramatic neuroscience advances, notably the discoveries that the medial brain stem is a major area of the brain for pain processing and that electrical stimulation of this area can turn pain off.

It all started back in 1969 when David Reynolds of the Stanford Research Institute discovered, in experimental animals, that electrical stimulation of the medial brain stem can inhibit pain. (The medial brain stem is deep in the middle of the brain, a continuation of the spinal cord that includes the hindmost portions of the brain—the medulla, pons, midbrain, thalamus and hypothalamus.) Then the following year John C. Liebeskind, a psychologist at the University of California at Los Angeles, and co-workers David Mayer and Huda Akil, took up where Reynolds left off.

During the past five years, Liebeskind reported at the recent annual meeting of the Society for Neuroscience, he and his colleagues have learned that the technique is indeed potent and that it is more effective if selected areas of the medial brain stem are stimulated. Examples are the periaqueductal gray matter of the midbrain or the nucleus *raphe magnus* of the medulla. They have obtained dramatic evidence that when they electrically tickle the medial brain stem, they are activating a descending nervous path which reaches down into the spinal cord and pinches off incoming pain information right there at the level of the spinal cord. And, most provocative, they have found that pain inhibition produced by stimulating the medial brain stem can be reversed by naloxone, a morphine antagonist.

"This was a terribly crucial observation," Liebeskind says, "because it suggested that the brain has some natural pain inhibitor similar to morphine and that we were simply stimulating the inhibitor into action." Indeed, this suggestion has subsequently been confirmed by John Hughes of the University of Aberdeen, Scotland, and by several other biochemists. They have found that the brain does contain such a pain inhibitor. They are now feverishly attempting to figure out the chemical structure of this inhibitor.

Meanwhile, Akil, who is now with Stanford University, Donald Richardson of Louisiana State University, and John Adams of the University of California at San Francisco, have been attempting to abolish chronic pain in patients by electrically stimulating their medial brain stems. So far they have tried the technique on some 17 patients; the patients are experiencing pain relief. Like James S., they carry battery packs to stimulate their medial brain stems whenever they feel pain. In fact, one of these patients has been successfully relieving his pain with a pack for two years now.

Does such a technique have any advantages over conventional pain relievers such as narcotics? Yes and no, Liebeskind replies. Obviously it's a lot easier to pop a pain pill every day than to stimulate your brain with a battery pack. But long-term use of narcotics, he notes, can lead to tolerance, the need for increased dosages and physical dependence. So, he foresees the continuing use of narcotics as pain relievers for patients who are in severe pain over the short term and electrical stimulation of the brain emerging as a means of pain relief for patients who suffer from pain for months or years on end.

But is there any danger that patients using this technique might stimulate the wrong neurons in their brains and thereby inadvertently alter their thoughts, emotions or behavior? Liebeskind says not. Electrodes are placed in a patient's brain on a temporary basis while he is awake and then are stimulated right away. Only if the electrodes produce the desired effect will the neurosurgeon implant them permanently in that position.

Liebeskind admits that certain questions still have to be answered about this highly experimental technique. One is what the long-term effects of brain stimulation to prevent pain will be. Still another is how much of pain relief is really due to this technique and how much is due to a placebo effect. □

Lasker awardees: Medical research honors

Last week, America's most prestigious medical research awards, the Albert Lasker awards, were presented, this year for a variety of medical accomplishments—medical technology development, hormonal research, immunological research, the pioneering of new drugs and efforts to improve vision.

Godfrey N. Hounsfield of the EMI Central Research Laboratories in Hayes, Middlesex, England, and William Oldendorf of the University of California at Los Angeles School of Medicine share a Lasker Clinical Research Award for their conception and development of the EMI scanner. The scanner, which makes possible for the first time an imaging of the brain and other soft tissues in the body, is revolutionizing diagnostic radiology (SN: 1/11/75, p. 27; 5/10/75, p. 303).

Roger C. Guillemin of the Salk Institute and Andrew V. Schally of the Veterans' Administration Hospital in New Orleans share a Lasker Basic Research Award for their hypothalamic hormone discoveries. Specifically, Guillemin has discovered several hormones released by the hypothalamus, notably somatostatin. Somatostatin inhibits the secretion of growth hormone from the pituitary gland (SN: 5/4/75, p. 286). Schally has also discovered several hypothalamic hormones, notably luteinizing hormone-releasing hormone. This hormone in turn stimulates the pituitary gland to release hormones which regulate male and female reproduction. Schally's discoveries are also opening the door to new kinds of birth control (SN: 7/17/71, p. 37; 11/6/71, p. 310; 1/8/72, p. 28).

Frank Dixon of the Scripps Clinic and Research Foundation in LaJolla, Calif., and Henry G. Kunkel of Rockefeller University have also received Lasker Basic Research Awards for their immunological research. Dixon has shown that immunological responses, which usually protect people, can malfunction and cause kidney, cardiovascular, joint and other diseases, and that many chronic viral infections can also trigger immunological diseases. Kunkel has shown how wayward immunological mechanisms underlie kidney disease and arthritis.

Four scientists at Merck, Sharp and Dohme Research Laboratories in Rahway, N.J., and West Point, Pa., have won a Lasker Special Award for pioneering new kinds of drugs. They are Karl H. Beyer Jr., James M. Sprague, John E. Bayer and Frederick C. Novello. A Lasker Public Service Award has also been given to Jules Stein, ophthalmologist and chairman of Research to Prevent Blindness, for his efforts to prevent blindness and restore sight.

During the 30 years that Lasker awards have been given, 25 awardees have gone on to win a Nobel Prize, including this year's physiology and medicine award winners (SN: 12/2/72, p. 365; 10/25/75, p. 261). □