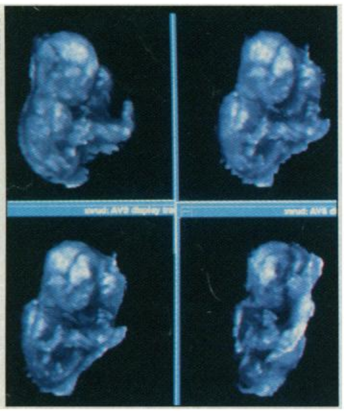
edited by KAREN FOX

NELSON



Baby pictures. Three-dimensional views of a 19-week fetus in utero.

Sonograms Take on a New Dimension

Although parents are usually awestruck by the fuzzy fetal features that appear on a sonogram, clinicians are much less impressed: The cloudy, flat image is far from an ideal diagnostic tool. "It's very hard for most people to look at a two-dimensional sonogram and take a lot away from it," says Thomas Nelson, a physicist at the University of California, San Diego. Nelson models physiology on computers, and he and his obstetrician wife, Dolores Pretorius of San Diego's Sharp Perinatal Center, decided to take sonograms to the next dimension. Literally.

Nelson and Pretorius are one of a handful of teams around the world creating three-dimensional sonograms. By coupling traditional ultrasound equipment—which produces the sound waves that make up a sonogram—with sophisticated computer algorithms, they can compile several two-dimensional pictures taken from a number of angles into a three-dimensional image of a fetus. Physicians can then rotate this three-dimensional image in any direction on a computer, potentially aiding in the diagnosis of hard to detect fetal problems involving the spine, skull, and face. In adults, the technique may help find microscopic tumors or heart abnormalities. Plans for clinical trials to assess whether the technology truly leads to better diagnoses are in the works.

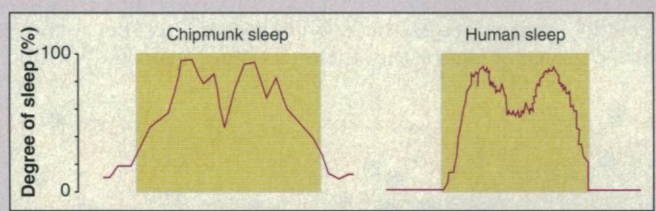
Sleeping the Sleep of Our Ancestors

In 1980, scientists at the National Institute of Mental Health (NIMH) found that cycles of light and dark can affect *Homo sapiens'* bodily functions: Much as it does in other mammals, light suppresses nocturnal secretion of the hormone melatonin. Until then, "it was thought humans had lost the ability to respond to light," says psychiatrist Thomas Wehr of NIMH.

Now, Wehr and colleagues have published a study taking their original finding a step further: By exposing humans to 14-hour "nights" they claim to have unmasked primordial sleep patterns and seasonal hormonal cycles in humans that year-round artificial lighting has suppressed.

For the month-long experiment, 15 subjects went about their normal business but returned to NIMH every night to spend 14 hours in complete darkness, with nothing to do but lie in bed. Not surprisingly, they slept more. But they also developed longer nocturnal periods of high melatonin and prolactin secretion and lower nocturnal peaks of growth hormone secretion. Melatonin "the chemical equivalent of darkness," says Wehr, gives other systems information on day length so they can "carry out their winter response."

Those patterns are familiar—if you study chipmunks. "The individuals in this experiment responded to changes in photoperiod duration as animals do," the authors write in the October *American Journal of Physiology*. The subjects' sleep patterns started looking more like those of chipmunks or sheep—with deepest sleep after dusk and before dawn, separated by a period of "quiet wakefulness." "This really is the first study showing that humans in the course of their evolution have retained a mechanism in the brain which can detect seasonal changes in day length," says Wehr.



The big sleep. Unlike a human's 8-hour night of constant sleep, a 14-hour sleep pattern, here shown graphed over the course of a night, looks like a chipmunk's, with an intermediate wakeful period.

SOURCE: WEHR ILLUSTRATION: H. BISHOP

Computer Language for Medical Records

No matter how Congress doctors the ailing health care system, a national medical record database is an essential part of the treatment. Two weeks ago, at the annual meeting of the American Medical Informatics Association in Washington, D.C., researchers presented several new options for comprehensive database structures to get the immense project off the ground. And at a linked meeting for the nonprofit, Computer-based Patient Record Institute (CPRI), experts agreed after preliminary analysis that one framework had emerged as the clear leader.

The system, called the Systematized Nomenclature of Medicine International (SNOMED), would function as an underpinning for the database, probably in combination with other medical vocabularies. SNOMED serves almost as an "atomic table of data elements for medicine," says Roger Côté of the University of Sherbrooke in Sherbrooke, Canada, a co-author of SNOMED. SNOMED would provide the database with more than 130,000 data elements coded to a variety of medical terms, as well as a structure for recording and analyzing patient information—something that has been difficult to standardize until now.

CPRI also plans to establish standards for protecting confidentiality—a major worry for patients and doctors—as well as to explore potential computer technologies to implement this record-keeping system. CPRI will issue a report on these subjects in early 1994. After that, it will be a matter of getting the government and key industry players to pay attention to the recommendations.

How to Make a Fossil

Becoming a fossil isn't easy. Only a few plant and animal remnants survive destruction, insulated from the elements long enough to become partly mineralized. But it's unclear just how they are protected from hungry scavengers, eroding chemicals, or turbulent environments, says oceanographer Eric Powell at Texas A&M University. Powell has just begun a series of research projects to examine exactly what happens in the first years of a potential marine fossil's life.

Leading a multi-institutional team of eight scientists, Powell has scattered mesh bags full of wood, shells, urchins, and crabs at depths ranging from 70 to 600 meters near the Bahamas and in the Gulf of Mexico. By scattering the bags at diverse locations, Powell hopes to see how different environments might affect a neophyte fossil. The team plans to pick up some of the bags, attached to floating markers, next summer and recover other bags in subsequent years. The scientists will then analyze the progressive degradation of the specimens and compare results from the warm, carbonate-rich waters of the Bahamas versus the colder, silty Gulf of Mexico. What they learn, the researchers hope, will clue them into the temperatures, depths, and chemical conditions that best preserve fossils.