Upping the chances of finding planets

A new generation of telescopes and the upgrading of existing instruments will soon enable astronomers to peer deeper into space and further back into time. But the improved optics have another payoff: boosting the odds of finding planets that lie outside the solar system but within our own galaxy.

In the May 25 NATURE, Adam S. Burrows and Jonathan I. Lunine of the University of Arizona in Tucson and their colleagues consider the feasibility of looking for young, giant planets—brighter and therefore more visible than older, smaller planets—at various distances from their parent stars.

They conclude that planets more massive than Jupiter and younger than 1 billion years have the best chance of showing up in telescope searches—especially if they lie farther from their stars than Jupiter does from the sun.

"That a young 'Jupiter' or 'Saturn' may be bright has been known for some time, but ours are the first detailed calculations for objects [with masses greater than Jupiter's] and ages greater than 10 million years," the team writes.

But brightness isn't the only consideration. To hunt planets, a telescope must detect faint objects and have high spatial resolution. Resolution allows the instrument to distinguish a planet from the star it orbits. The planned Large Binocular Telescope, the Near Infrared Camera and Multi-Object Spectrometer (NICMOS) due for installation on the Hubble Space Telescope in 1997, and the proposed Space Infrared Telescope Facility have the capacity to discover a variety of massive planets, the scientists note.

In particular, NICMOS can detect a planet 400 light-years away—as distant as the Pleiades star cluster—if the body has at least six times Jupiter's mass and travels in a sufficiently wide orbit.

More generally, the team says that none of the new or upgraded telescopes will have the resolution to find a massive planet in the Pleiades unless the object lies at least as far from its parent as Neptune's separation from the sun. Infrared telescopes can more easily detect very massive planets because these objects generate enough heat to emit a copious amount of infrared light.

Scientists have noted that giant planets like Jupiter may be rare (SN: 4/22/95, p.251). But it still pays to look, Lunine says, because knowing the population of big planets "cuts to the heart of whether we will find inhabitable planets." At least in our solar system, large outer planets protect smaller ones, such as Earth, from bombardment by comets. —*R. Cowen*

Lineage of Y chromosome boosts Eve theory

Men all over the world have an identical stretch of DNA on their Y chromosomes, researchers have discovered. The finding provides further evidence for the controversial theory that modern humans may originate from a single, recent population, they assert.

Other researchers argue that humans originated about 1 million years ago in different regions of the world. In 1987, however, molecular biologists began publishing analyses of mitochondrial DNA, which only women pass on to their offspring. These results suggest that all humans evolved from one woman, dubbed Eve, or more likely from a small group of women, living about 200,000 years ago in Africa (SN: 9/25/93, p.96).

"There's something tantalizing about the fact that two completely different parts of the genome are beginning to tell the same story," says Robert L. Dorit of Yale University. Dorit coauthored the new study, which appears in the May 26 SCIENCE.

"Everyone has eagerly awaited dates for the diversity of other regions of the genome that could support or contradict the mitochondrial evidence," notes Svante Pääbo of the University of Munich in Germany, in an accompanying commentary.

The equivalence of the Y chromosome DNA in different people suggests that all human Y chromosomes share a recent ancestor and that not enough time has elapsed for differences to develop, Dorit asserts. He and his colleagues looked for variations in part of the ZFY, or zinc finger y, gene in 38 men from around the world. They also compared ZFY in three species: chimpanzee, gorilla, and orangutan.

ZFY, handed down exclusively from father to son, appears to help with sperm or testes maturation. The gene sits on a segment of the Y chromosome that doesn't recombine, a process that involves the exchange of genetic information with a partner chromosome and that tends to muddy evolutionary history, Dorit notes.

To calculate the rate at which mutations accumulate in the segment of ZFY that they examined, Dorit and his group compared the DNA sequences of the four species—chimps, humans, orangutans, and gorillas—that they studied.

For each pair of species, such as chimps and humans, they then divided the number of DNA sequence differences by the number of years since the two shared a common ancestor. Humans diverged from chimps and gorillas about 5 million years ago, for example. The scientists calculated that 0.135 percent of the DNA changes every 1 million years. Humans had to have originated roughly 270,000 years ago to have such similar Y chromosomes.

Dorit and his coauthors acknowledge that factors other than a recent common ancestor could explain their findings, but none of these holds up as well, they say. Nonetheless, researchers need to do more work on the rate of ZFY variation among nonhuman primates, Pääbo notes.

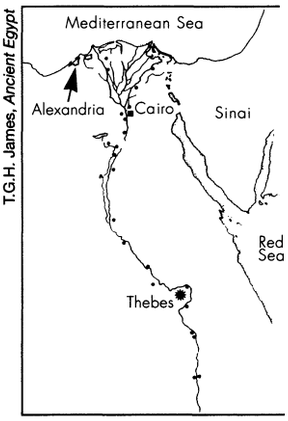
— T. Adler

Ancient Egyptian tomb held royal sons

Ramses II, one of ancient Egypt's most powerful rulers, continues to wield his influence from beneath the desert sands he once trod. An archaeological team announced last week its discovery of the largest and most complex tomb known in Egypt's Valley of the Kings. Ramses II (or Ramesses II, according to some researchers) apparently built this sprawling set of at least 67 chambers as a mausoleum for many of his 52 sons.

Further excavation and study of the massive burial site will shed light on the chronology, artwork, and royal family life during a critical period in Egypt's history, the 67 years from 1279 B.C. to 1212 B.C. when Ramses II was pharaoh. Ramses II is traditionally thought to have reigned at the time of the Israelites' exodus from Egypt.

"We've found a new type of tomb from ancient Egypt, a family mausoleum," Kent R. Weeks told SCIENCE NEWS. "This is the first major discovery in the Valley of the Kings since 1922, when Tutankhamen's tomb was found." Weeks, an archaeologist at the American University in Cairo, directs the ongoing excavation.



T.G.H. James, *Ancient Egypt*

Star denotes the Valley of the Kings.

Nearly all pharaohs from 1550 B.C. to 1070 B.C. were buried in the Valley of the Kings, located about 300 miles south of Cairo on the western side of the Nile River.

An English traveler first exposed the entry area to the new find in 1820, after digging through flood debris that clogged the passage. English archaeologist Howard Carter reopened the tomb about 100 years later but soon abandoned the site and heaped dirt from the excavation of Tut's tomb on top of it.

Weeks' team knew from a previously found piece of ancient papyrus scroll