Greater acceptance might soon be forthcoming. Preliminary evidence from the 1971 season was reported in November (SN: 11/27/71, p. 357). Last week at a talk in Washington, Leakey said he is now prepared to put his neck and his theory on the chopping block. His data (based on fossil skulls, jaws and post-cranial material) have been submitted to NATURE and will be published in March.

"One of the exciting results of these 3 jaws and the 14 other specimens attributable to the genus *Homo* is that we can now say absolutely, definitely, without any doubt at all that at East Rudolf the genus *Australopithecus* coexisted with the genus *Homo*," Leakey said.

The limb bones show that *Homo* was an upright walker. Site situations show that he was a hunter who brought his kill back to a fixed, firm base. And more than 400 manmade artifacts (chopper tools and a series of unexpected blade tools) show that *Homo* practiced hunting technology (the tools were found with broken animal bones). Meanwhile, *Australopithecus* ("we do not know anything about his locomotor behavior," said Leakey), probabaly without any technology, lived alongside *Homo*. All of this, Leakey stressed, took place 2.6 million years ago—1.6 million years before the previously accepted date.

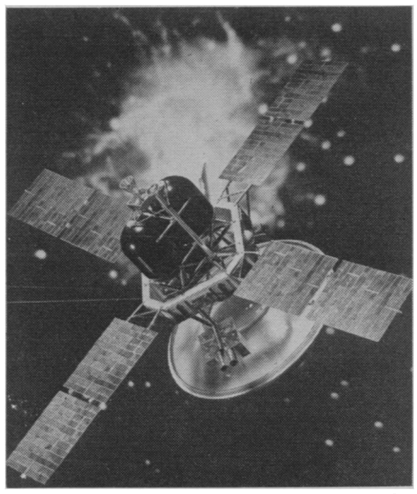
"This is the first time," he goes on, "that there has been sufficient evidence to really make this point stick. And it clearly has tremendous importance in the interpretation of the origin of ourselves. For me," he said, "I think we will take both lineages back well beyond two million, probaby as far back as four million years as quite distinct lines of hominid development with *Australopithecus* being a specialization (a herbiveral) that had nothing whatsoever to do with the development of the genus *Homo*. The genus *Homo* has its own ancestry going back equally far, both of them coming from the same common origin sometime in the Pliocene." □

Viking: Painful decisions on payload cutbacks

As Mariner 9 completed its third month in Martian orbit last week, scientists and program managers were meeting at the Jet Propulsion Laboratory to review the next probes to Mars—two Viking spacecraft that will place two craft in orbit and two landers on the surface in 1976 (SN: 7/24/71, p. 64). The meetings were billed as a major science review—the last chance to make major payload changes based on new information from Mariner 9. It may turn out, however, to be only the first of many such meetings between now and 1975 to find ways to keep Viking within the budget ceiling of $830 million that NASA has set for itself.

Now it appears that NASA headquarters will have to make some painful decisions within the next few weeks whether to cut out a few instruments or cut back by simplifying the ones that will fly.

The Viking spacecraft are the largest and most complex unmanned payloads (equal only to earth-orbiting geophysical observatories) NASA has ever tried to build. When NASA first studied landers, the cost of development was estimated at $300 million. But when industry looked at the proposals, it said the job couldn't be done for less than $600 million. Then in 1970 NASA postponed the launches from 1973 to 1975 (to save money in the 1971 budget), and the cost of delay was estimated to be from $100 million to $150 million. It was then that NASA placed the budgetary ceiling on Viking of from $750 million to $830 million. Since then, Viking costs have been kept within that limit.



NASA

Viking '76: Trimming the payload.

But recent trends—rising costs, problems with weight and volume, and difficulties with some of the instruments—began to alarm the project managers. In addition, scientists recently have been questioning the wisdom of not flying any instruments to analyze the soil—even though NASA's decision to fly primarily biology instruments was based on a National Academy of Sciences Space Science Board recommendation. What if there were no life on Mars? Shouldn't the landers tell us something about the soil? Two instruments were mentioned as possible candidates to fill this gap—one using alpha scattering and one using X-ray fluorescence. The X-ray instrument is believed to have a slight edge for getting on Viking because it weighs only two pounds (as opposed to 10 to 12 pounds for the alpha particle device), and it can distinguish between potassium and calcium concentrations in the soil—important ingredients in determining the amount of chemical differentiation a planet has undergone.

The recent cost-increase problems center on five complex experiments—a gas chromatograph/mass spectrometer that will measure the molecular weights of compounds retrieved by a soil sampler and the four biology or life detection experiments. Even in the beginning, these five experiments were assigned a "category 3" rating—too difficult to fly on a spacecraft without extensive further development. Although this has turned out to be the case, the instruments seem to be valued even more now that the Mariner 9 results have shown the possibilities of finding life to be apparently somewhat greater than had earlier been expected (SN: 2/12/71, p. 106).

In the judgment of most of the scientists participating in last week's meeting, the options now being considered by NASA headquarters will not compromise the over-all scientific aims of Viking. The options include: flying the Mariner 9 infrared radiometer instead of the more complex and expensive one proposed for Viking; using orbital cameras that provide 100-meter instead of 25-meter resolution; taking the gas chromatograph off, but leaving the mass spectrometer; and possibly taking off one of the biology experiments. (The space vacated by the biology experiment would leave room for the X-ray fluorescence instrument.) A few management changes could also be made to save money, and NASA is looking at these possibilities. The National Academy of Sciences is also looking at ways to cut back on spacecraft sterilization techniques (to save about $1 million) that would not compromise the biology experiment or contaminate Mars itself.

Even if all of these changes were made, Viking would still be a packed spacecraft. Three biology experiments would remain. There would be orbital cameras and two landing cameras (stereo and color); the mass spectrometer; sensors for measuring surface and atmospheric pressures, temperatures, wind and humidity; a seismometer; magnets to measure magnetic properties; a soil sampler; and radio and radar systems. There will also be water vapor and thermal mapping instruments.

It was the general consensus that NASA headquarters would make every effort for political if not scientific reasons not to take any experiment off and that most of the changes would be made by simplifying the hardware but preserving the gut of the experiments. □