slow the vehicle until it entered an orbit about Mars. During a three- to four-week stopover at Mars, a portion of the crew would descend to the surface—probably using a chemically powered rocket—perform their exploration, and return to the mother craft. Then a third nuclear rocket stage would send the spacecraft back to earth, where the speed of the approaching spacecraft would be reduced using a chemically powered rocket, and the landing technique would be similar to that employed in the Apollo missions. The crew would use the earth's atmosphere to help brake their descent.

To accommodate the trend toward heavier payloads and shorter trip times, which would ultimately come about in our advanced exploration of the planets, we may require new nuclear propulsion systems and flight stages. A capability might be established that would either increase the payload or shorten the trip time to Mars and Venus and make possible Voyager-type flights to Jupiter, Saturn, Mercury, and selected asteroids and comets. The low-thrust nuclear electric propulsion system might provide an ideal way of accomplishing such a task. Each such member of the solar system offers unique opportunities to contribute to our knowledge of the universe. It has even been suggested that we capture an asteroid, which may be a fragment of a shattered planet, and by nuclear propulsion bring it into orbit about the earth where it can be analyzed thoroughly.

Summarizing the role of nuclear propulsion in space, we see that both nuclear rockets and nuclear electric propulsion systems offer substantial advantages in the exploration of the solar system. The combination of high-thrust nuclear rockets for escape from planetary gravity fields and low-thrust low-weight nuclear electric systems for interplanetary propulsion promises to do great things for solar system exploration.

But, as I indicated earlier, we are not going to accomplish much in space, no matter how far or with how much versatility we can propel ourselves, unless we take with us enough energy to power our scientific, communication, and life-support equipment. To this end our SNAP systems will play a primary role in future space programs. How will they accomplish this, and what are their advantages over other systems?

First, let me point out that such nuclear energy sources are for missions of longer duration than a few hours to a few days. For those short-lived missions, batteries or fuel cells are usually the lightest, smallest power sources. For the long-lived missions, the main com-