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Laying the Foundations for Space Exploration

Throughout human history people have always been awed and fascinated by the heavens. The magnificence and movement of the Sun, the stars, and the planets have repeatedly inspired wonder, study, and a search for meaning among the various civilizations that beheld them. While the astronomers of the ancient world may have viewed the cosmic firmament through a religious lens—identifying its various elements with a rich tapestry of gods, heroes, and beasts of many kinds—they nonetheless managed to establish the size of the Earth, and chart the rising and setting of constellations, the movement of the planets and distances around the globe. They even went so far as to build structures, such as Stonehenge in England, that aligned with the movement of particular celestial bodies at specific times of the year.

Gradually, humanity uncovered the science that explained the basic workings of the solar system. From the start of the scientific revolution of the sixteenth century, the work of astronomers, such as Copernicus and Galileo (see p.12), and the experimental physicist Isaac Newton (see p.15) did much to transform humanity's perspective on the universe. In turn, their scientific achievements helped inspire generations of science fiction writers, from Cyrano de Bergerac to Jules Verne (see p.18), and even early filmmakers, such as Georges Méliès and Fritz Lang (see p.19), to imagine and explore their ideas of what space travel might be like.

But it wasn't until the opening years of the twentieth century when the great pioneers of space travel: the Russian Konstantin Tsiolkovsky (see p.20), the American Robert H. Goddard (see p.22), and the German Hermann Oberth (see p.24), together with various other rocketry advocates such as Robert Esnault-Pelterie (see p.28), and the numerous amateur rocket societies around the globe (see p.29) began to make the first tentative steps toward making space travel and space exploration a reality.

OPPOSITE The beauty of the universe: stunning images taken by both the Hubble Space Telescope and the Spitzer Telescope have been digitally combined to create this incredible picture of the Whirlpool Galaxy, M51.

The Mir Space Station

The beginning of the 1970s saw the Soviet Union launch a succession of space stations into Earth orbit. The Almaz and Salyut series of stations certainly collected valuable information, but the Mir station was the pinnacle of Soviet space technology. Launched on February 20, 1986, Mir was the core of a projected larger facility. By the early 1990s, after the addition of further modules over time, the complex had grown to a weight of about 110 tons (99 t) boasting 13,000 cubic feet (368 cu m) of habitable space.

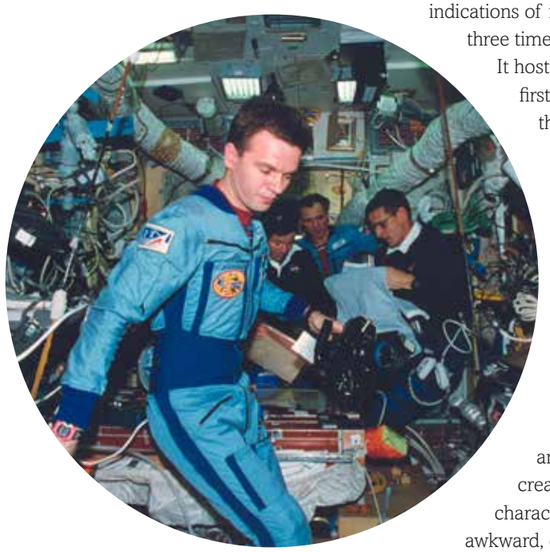
With the launching of these stations, the Soviet Union intended to explore long-duration human spaceflight, hoping to learn what would be needed to engage in deep space exploration. In that regard, the Mir program proved enormously fruitful. Cosmonauts Vladimir Titov and Musa Manarov orbited the Earth aboard the station for a total of 366 days between December 21, 1987, and December 21, 1988—a timespan that far exceeded that of any previous spacefarers. Even this long-duration mission paled in comparison to an incredible 438 days in orbit for Valeri Polyakov between January 8, 1994, and March 22, 1995. With the exception of around four months in 1989, the Mir complex was continuously occupied from February 1987. Numerous maintenance, repair, and construction tasks, and new-technology demonstrations were also carried out during two-person extravehicular activities (EVAs).

The space station Mir should be considered a tremendous success story for the Soviet Union—a representation both of the nation's past space glories and indications of its future as a space pioneer. Mir endured fifteen years in orbit, three times its planned lifetime, and outlasted even the Soviet Union itself. It hosted scores of crewmembers and international visitors. It raised the first crop of wheat to be grown from seed to seed in outer space. It was the backdrop to joyous reunions, feats of courage, moments of panic, and months of grim determination. It suffered dangerous fires, a near-catastrophic collision, and desperate periods of out-of-control tumbling. Traveling at an average speed of 17,885 miles per hour (28,783 kph), the space station orbited about 250 miles (402 km) above Earth and could be seen on clear nights as a bright light racing across the northern sky.

Mir also represented both the best and worst of Soviet technology. It was robust, coarse, accident-prone, and a marvel. It combined the bluster of former Soviet Union Premier Nikita Khrushchev, the grace of Russian–U.S. ballet dancer Mikhail Baryshnikov, the genius of Russian author Aleksandr Solzhenitsyn, and the brilliance of Russian nuclear physicist Andrei Sakharov to create a weird, ugly, and highly successful space vehicle. Mir conjured characterizations as diverse as great and graceful, incongruous and awkward, esthetically pleasing and troubling, all in the same mind.

BELOW Mir was always a hectic, fairly messy place to live and work. Here is the interior of Mir's Spektr module, showing cosmonaut Vladimir Dezhurov as he re-routes cable as part of the module's activation process in 1995.

OPPOSITE The Salyut 7 in Earth orbit with a Soyuz T ferry craft attached in mid-1980s.



International Participants on Space Station Mir

1987–1992

Muhammed Faris
Syria
Soyuz TM3/Mir
22 July 1987

Aleksandr Aleksandrov
Bulgaria
Soyuz TM5/Mir
7 June 1988

Abdul Ahad Mohmand
Afghanistan
Soyuz TM6/Mir
29 August 1988

Toyohiro Akiyama
Japan
Soyuz TM11/Mir
2 December 1990

Helen Sharman
United Kingdom
Soyuz TM12/Mir
18 May 1991

Franz Viehböck
Austria
Soyuz TM13/Mir
2 October 1991

Klaus–Dietrich Flade
Germany
Soyuz TM14/Mir
17 March 1992

Michel Tognini
France
Soyuz TM15/Mir
27 July 1992