



## Manned Lunar Landing

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The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.

**Manned Lunar Landing**

The nation is committed to the manned lunar landing program. Nevertheless, the project seems certain to be the center of continuing controversy. Each year Congress will vote on appropriations, and this guarantees a recurring re-examination of the basic rationale of the program.

Four principal justifications have been cited: The propaganda value of beating the Russians, possible military applications, technological fallout, and scientific values.

The nation may sustain the continuing burden of the program principally because of man's spirit of adventure—his desire to conquer the inanimate. An earlier generation was excited about reaching the North Pole. Later, Lindbergh's flight was greeted with wild enthusiasm. However, the emotional peak was sharp and soon dissipated. The sequence of public reaction to the orbiting astronauts is instructive. Our first success was witnessed by a huge enthralled audience. A later episode was considered routine. The lasting propaganda value of placing a man on the moon has been vastly overestimated. The first lunar landing will be a great occasion; subsequent boredom is inevitable. Interest in lunar exploration will be sustained only if there are important military implications, exciting scientific accomplishments or technological fallout.

Military applications seem remote. The cost of a missile based on the moon would be about a hundred to a thousand times that of an earth-based device. The trajectory of a missile from the moon to the earth is complicated; a slight malfunction would be disastrous. Another proposed application is surveillance of other countries. The disadvantages of observing from a distance of 240,000 miles rather than from much nearer are obvious.

The National Aeronautics and Space Administration has sought examples of technological fallout from its program. To date, those cited have not been impressive. The problems of space are different from the problems of the earthly tax-paying economy. Not more than a small fraction of the cost of the moon program will be recovered through technological fallout.

The scientific exploration of the moon has been accorded a secondary priority in the lunar program. This has been indicated in the attitude surrounding presentation of the new budget to Congress and underlined by the decision not to have a scientist in the first lunar astronaut crew. If expert human observers are not to be employed, the alternative of exploration by electronic gear becomes exceedingly attractive. The cost of unmanned lunar vehicles is on the order of 1 percent of the cost of the manned variety; unmanned vehicles can be smaller and need not be returned. Most of the interesting questions concerning the moon can be studied by electronic devices. These include important puzzles concerning selenodesy (the analogue of geodesy), topography, and the particle size, chemical composition, and mineralogy of the lunar surface. Investigations of the internal constitution and seismicity could also be conducted electronically. Observations of the sun and other stars could be made in which a far wider segment of the electromagnetic spectrum could be employed than is available through man's vision. Unmanned exploration could provide the basis for realistic design of manned landing craft, thus decreasing the total costs and increasing the chances of success. A re-examination of priorities is in order.—P.H.A.