The New Moon

Water, Exploration, and Future Habitation

Explore Earth's closest neighbor, the Moon, in this fascinating and timely book and discover what we should expect from this seemingly familiar, but strange, new frontier. What startling discoveries are being uncovered on the Moon? What will these tell us about our place in the Universe? How can exploring the Moon benefit development on Earth?

Discover the role of the Moon in Earth's past and present; read about the lunar environment and how it could be made more habitable for humans; consider whether continued exploration of the Moon is justified; and view rare Apollo-era photos and film stills.

This is a complete story of the human lunar experience, presenting many interesting but little-known and significant events in lunar science for the first time. It will appeal to anyone wanting to know more about the stunning discoveries being uncovered about the Moon.

ARLIN CROTTS is Professor of Astronomy at Columbia University and has won numerous awards for his work. Having observed objects as distant as ten billion light years and as close as the Moon, he finds the problems of lunar science particularly intriguing.

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Arlin Crotts
Columbia University, New York

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Preface

There is a new Moon. Many of the most dramatic recent discoveries in planetary science are lunar. They transform our understanding of the Moon and lunar exploration's prospects for exciting work there. Yet in many minds the Moon is an old story. NASA sent a dozen men to its surface in 1969–1972, and most people do not remember those events personally. Only in the past few years has lunar exploration accelerated again, and many, including policy makers deciding about the space program, do not realize how rapidly our knowledge of the Moon is changing.

This ignorance is unfortunate, since from 2004 to 2010 we were headed to the Moon but changed our minds. Some of these recent discoveries about the Moon might have changed our minds back again. By "our" in this case I refer to the United States, since many other nations' space programs still see the Moon as an essential objective.

This book's purpose is to provide information that the reader might need to decide if the Moon is worthy of our exploration and what we might do there. What has affected our decisions to explore the Moon (or not) and what must we consider in the future, at least until the mid-21st century? What place could lunar exploration play in space exploration, and in the human future in general? There is politics involved, and international relations. Humans will significantly influence Earth's environment over this time, soon to our detriment. This will affect our economics. Human technology and communications will change, and lunar exploration might play a natural role in this, all by mid-century.

Because of recent political decisions in the United States we do not know where we are headed beyond low Earth orbit (and by "we" here I could mean the whole world). The Obama administration has suggested a mission to an asteroid by the mid-2020s and then on to Mars, but this decision is scheduled to be reconsidered in a few years. None of the political, budgetary, and programmatic considerations tilting towards the asteroids and Mars change the fact that the Moon is 100 times closer on average. This is qualitatively decisive, since round-trip light-travel times to the Moon allow remote control of robots in real time, whereas on Mars or an asteroid the delays change this drastically. Also, the environment of the Moon is not as harsh as sometimes advertised; the implications of this must be considered. I want to present these facts and let the reader decide what to do about them. Is the Moon interesting enough?

Humans face challenges in the coming decades, and to many of these the Moon holds no answer. War, poverty, strife, and environmental degradation are problems for which we must look to ourselves for solutions, not to the Moon. Still, the Moon

has great potential. Perhaps if we had continued the course set in 1961 but abandoned in 1972, more tools would be available now and in time to defeat obstacles to continued civilized existence. Perhaps that was a vain hope.

But the Moon offers hope. It can be a productive, comfortable, economically viable place, and depending on available modes of transportation, can benefit directly and host many people. Possibly within the lifetimes of many people today, we will see ourselves, relatives, and neighbor's children live and work on the Moon. It is like a new continent, larger than North America or Africa, nearly the area of Asia, with real possibilities for economically viable and comfortable lives for people who live there.

Like Columbus, starting with three ships, then a few more, followed by dozens and hundreds within a few generations, we have started (except this time with robots) the human race's journey to this new land. With six ships, and twelve men, we have just scratched its surface. It is our choice as to whether we continue. Like the Ming emperor, we might burn the fleets of Zheng He (Chung Ho) and journey no more across the great oceans, or like Leif Ericsson and his clan, we might establish a toehold in this new world, only to see it sink into obscurity, an archeological curiosity, no more than an amusing tale in the Icelandic Sagas.

In the lexicon of human symbols, the Moon is among the most potent, but it is much more than a symbol; it is a whole world, the one most familiar to us, save Earth, but surprisingly unknown, and still potentially concealing surprises. In this book we discuss little the Moon of old, of historical record, the poet, the shaman, or the artist. Instead, we will discuss the Moon of the scientist, astronaut, and engineer, and hopefully the Moon in humanity's future. It is for us to choose.

This book was not written to dwell on the politics of The Return to The Moon, although one cannot speak of humankind and the Moon without touching on NASA and its initiatives. The Moon arose 4.5 billion years before the creation of NASA, and humanity's reach for the Moon was set in motion at least 100,000 years ago.

The Moon is a world, a physical environment in which people can be comfortable and productive someday. This book's purpose is to describe how this world could become familiar to us. I have no crystal ball to reveal this, but the journey may have now begun in earnest. I invite readers to consider if this should be our coming destination.

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