We seem to be at the dawn of a major change in human growth, for as little Evan suggests in the photo that precedes the beginning of this chapter, we may be like the hatching chicken that has exhausted the resources of its inner-egg environment and is about to break through to a whole new range of possibilities. Earth is our cradle and has served us well. But cradles, however comfortable, are outgrown one day. So, with the inspiration that in many ways is similar to the inspiration of those who built the early cathedrals, synagogues, temples, and mosques, we aim for the cosmos.

We live in an exciting time!

For instructor-assigned homework, go to www.masteringphysics.com MP

SUMMARY OF TERMS (KNOWLEDGE)

Scientific method Principles and procedures for the systematic pursuit of knowledge involving the recognition and formulation of a problem, the collection of data through observation and experiment, and the formulation and testing of hypotheses.

Hypothesis An educated guess; a reasonable explanation of an observation or experimental result that is not fully accepted as factual until tested over and over again by experiment.

Scientific attitude The scientific method inclined toward inquiry, integrity, and humility.

Fact A statement about the world that competent observers who have made a series of observations agree on.

Law A general hypothesis or statement about the relationship of natural quantities that has been tested over and over again and has not been contradicted. Also known as a *principle.*

Theory A synthesis of a large body of information that encompasses well-tested and verified hypotheses about certain aspects of the natural world.

Pseudoscience Fake science that pretends to be real science.

READING CHECK QUESTIONS (COMPREHENSION)

1.1 Scientific Measurements

1. Briefly, what is science?
2. Throughout the ages, what has been the general reaction to new ideas about established "truths"?
3. When the Sun was directly overhead in Syene, why wasn't it directly overhead in Alexandria?
4. Earth, like everything else illuminated by the Sun, casts a shadow. Why does this shadow taper?
5. How does the Moon's diameter compare with the distance between Earth and the Moon?
6. How does the Sun's diameter compare with the distance between Earth and the Sun?
7. Why did Aristarchus choose the time of a half Moon to make his measurements for calculating the Earth–Sun distance?
8. What are the circular spots of light seen on the ground beneath a tree on a sunny day?
9. What is the role of equations in this book?

1.2 Scientific Methods

10. Outline some steps of the scientific method.
11. Distinguish among a scientific fact, a hypothesis, a law, and a theory.
12. In daily life, people are often praised for maintaining some particular point of view, for the "courage of their convictions." A change of mind is seen as a sign of weakness. How is this different in science?
13. What is the test for whether a hypothesis is scientific or not?
14. In daily life, we see many cases of people who are caught misrepresenting things and who soon thereafter are excused and accepted by their contemporaries. How is this different in science?
15. What test can you perform to increase the chance in your own mind that you are right about a particular idea?

1.3 Science, Art, and Religion

16. Why are students of the arts encouraged to learn about science and science students encouraged to learn about the arts?
17. Must people choose between science and religion?
18. Psychological comfort is a benefit of having solid answers to religious questions. What benefit accompanies a position of not knowing the answers?

1.4 Science and Technology

19. Clearly distinguish between science and technology.

1.5 Physics—The Basic Science

20. Why is physics considered to be the basic science?