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1.6 Metazoan Organisms Widely Used in Cell Biology Research

Nothing in biology makes sense except in the light of evolution.

—Theodosius Dobzhansky, 1973, essay in *American Biology Teacher* 35:125–129

Biology is a science fundamentally different from physics or chemistry, which deal with unchanging properties of matter that can be described by mathematical equations. Biological systems, of course, follow the rules of chemistry and physics, but biology is a historical science, as the forms and structures of the living world today are the results of billions of years of evolution. Through evolution, all organisms living and extinct are related in an evolutionary family tree extending from primitive single-celled organisms that lived in the distant past to the diverse plants, animals, and microorganisms of the present era (Figure 1-1, Table 1-1).

The great insight of Charles Darwin was the principle of natural selection: organisms vary randomly and compete within their environment for resources. Only those that survive and reproduce are able to pass down their genetic traits (Figure 1-2).

At first glance, the biological universe does appear amazingly diverse—from tiny ferns to tall fir trees, from single-celled bacteria and protozoans visible only under a microscope to multicellular animals of all kinds. The discovery that all living organisms are made up of cells was one of the most remarkable discoveries in biology. Indeed, cells come in an astonishing variety of sizes and shapes (Figure 1-3). Some move rapidly and have fast-changing structures, as we can see in movies of amoebae and rotifers. Others are largely stationary and structurally stable. Oxygen kills some cells but is an absolute requirement for others. Most cells in multicellular organisms are intimately involved with other cells. Although some unicellular organisms live in