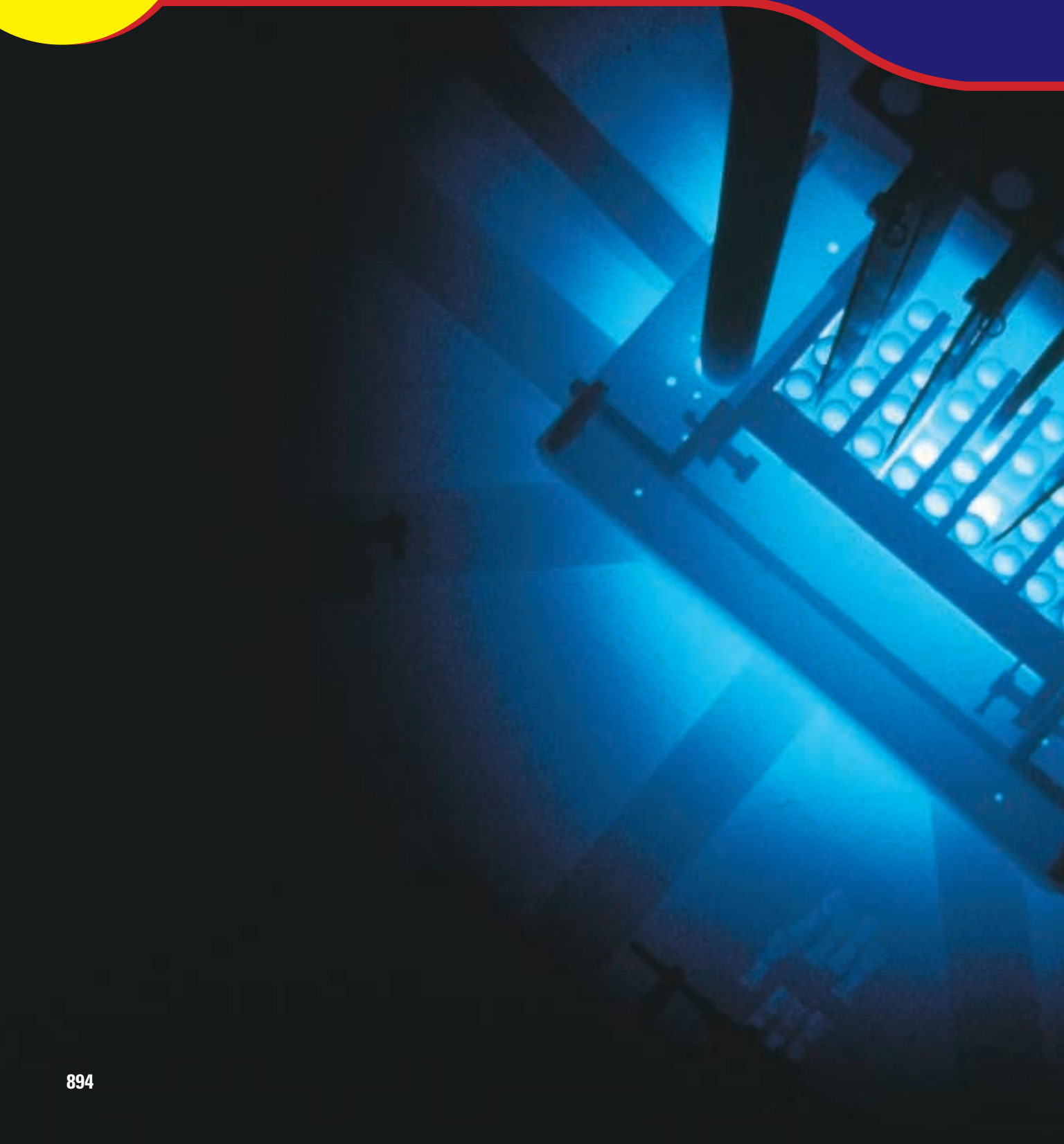
UNIT 8

Nuclear Physics



UNIT CONTENTS

The blue glow in the water around an operating nuclear reactor creates an eerie, science fiction-like quality. No fiction is needed, however, to explain the blue glow, called Cerenkov radiation in honour of Russian physicist, Pavel Cerenkov (1904–1990). The glow can only be seen when charged particles travel faster than the speed of light in the medium in which they are moving. The glow is seen around nuclear reactors because the products of nuclear fission reactions emit highly energetic beta particles. The fast-moving beta particles create a cone of a very strong electric field. This cone is analogous to the shock wave created by a jet travelling faster than the speed of sound in air (see Figure 9.19, page 393). As the cone of the electric field passes, water molecules align in the field. After the electric field has passed, the water molecules "snap back" or realign into their original orientation. When they realign, the water molecules emit photons in the blue and ultraviolet regions of the electromagnetic spectrum.

In this unit, you will learn about nuclear fission reactions and why they release such enormous amounts of energy. You will also discover why the products of the fission reaction are highly radioactive. In addition, you will learn how nuclear energy can be transformed into electric energy.

UNIT PROJECT PREP

At the end of this unit, you will have a chance to examine the issues surrounding nuclear fission as a source of energy. You will compare them to the issues surrounding traditional fuel sources, such as coal. Go to your e-book for a preview of the issues to keep in mind as you read this unit.