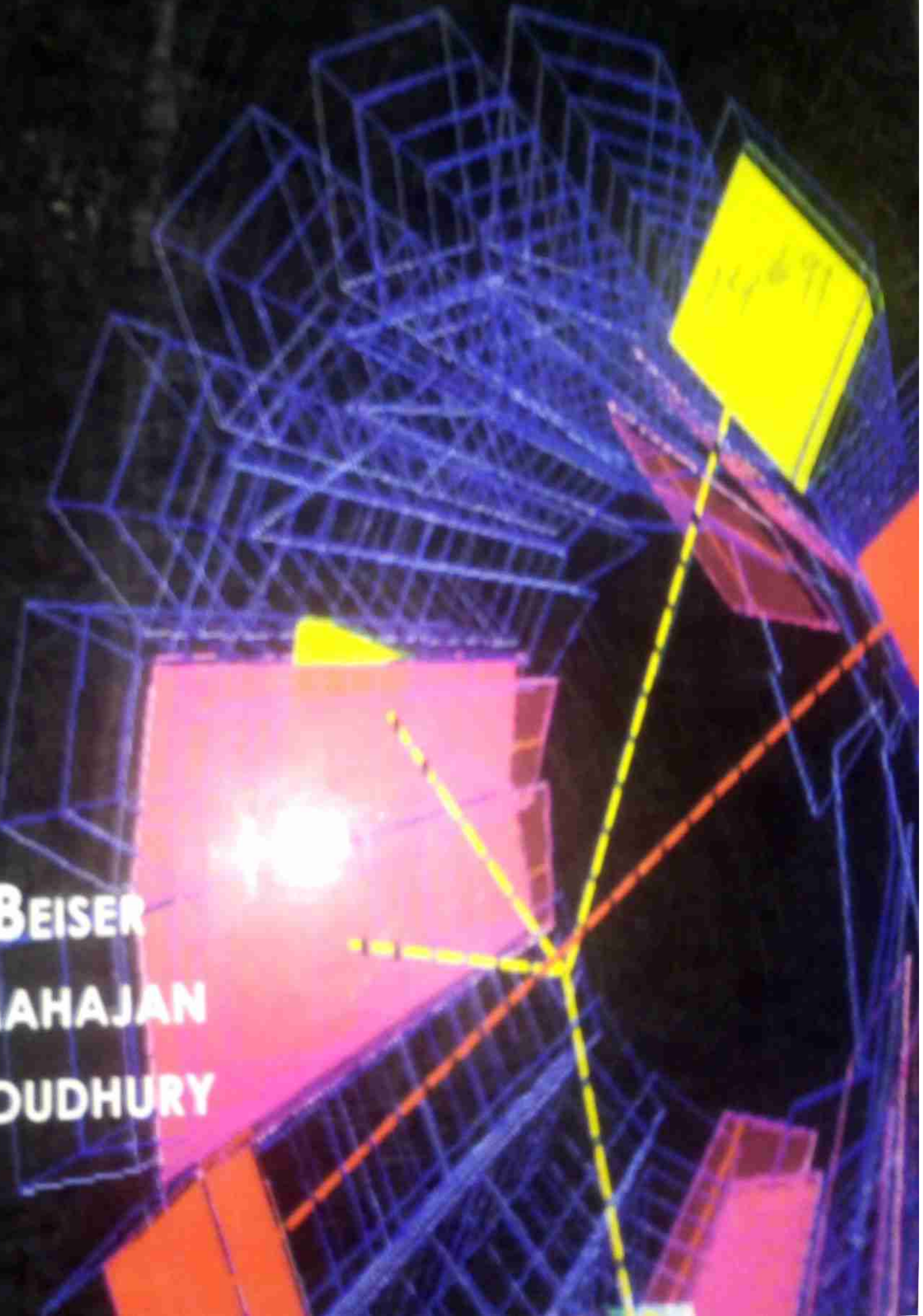
CONCEPTS OF

MODERN PHYSICS

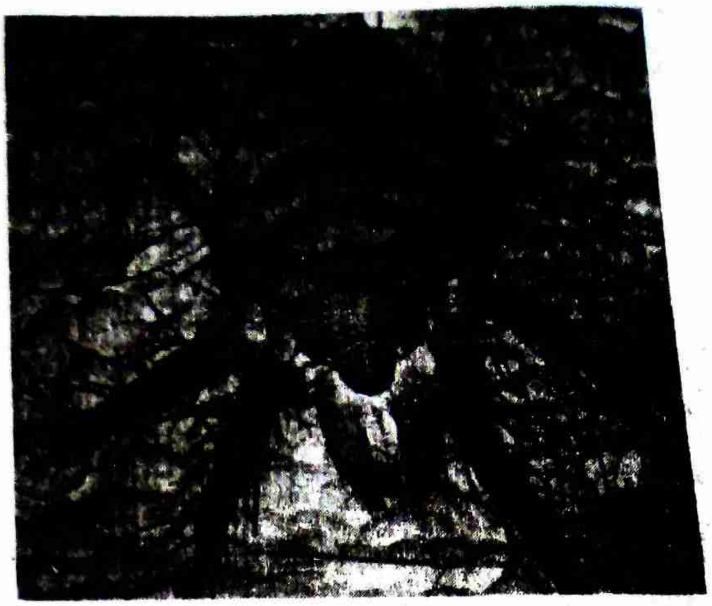
7ED



ARTHUR BEISER
SHOBHIT MAHAJAN
S. RAI CHOUDHURY

Contents

CHAPTER 3



In a scanning electron microscope, an electron beam that scans a specimen causes secondary electrons to be ejected in numbers that vary with the angle of the surface. A suitable data display suggests the three-dimensional form of the specimen. The high resolution of this image of a red spider mite on a leaf is a consequence of the wave nature of moving electrons.

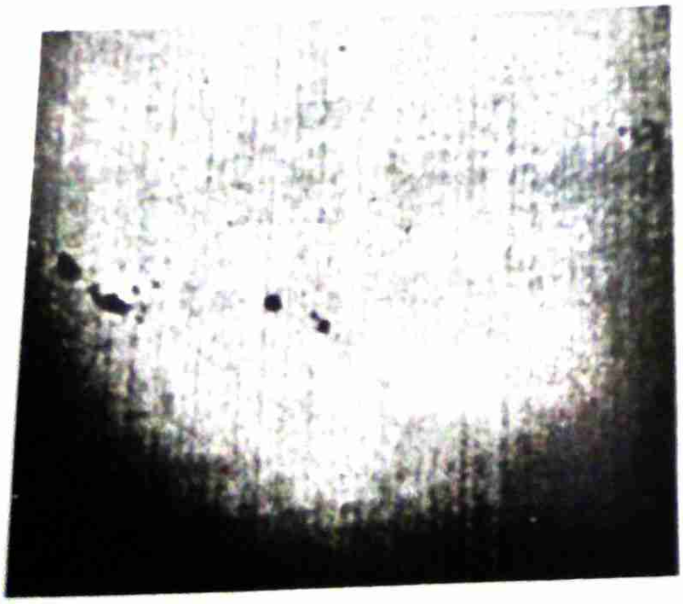
CHAPTER 4

Solid-state infrared laser cutting 1.6-mm steel sheet. This laser uses an yttrium-aluminum-garnet crystal doped with neodymium. The neodymium is pumped with radiation from small semiconductor lasers, a highly efficient method.

CHAPTER 5

Scanning tunneling micrograph of gold atoms on a carbon (graphite) substrate. The cluster of gold atoms is about 1.5 nm across and three atoms high.

CHAPTER 6



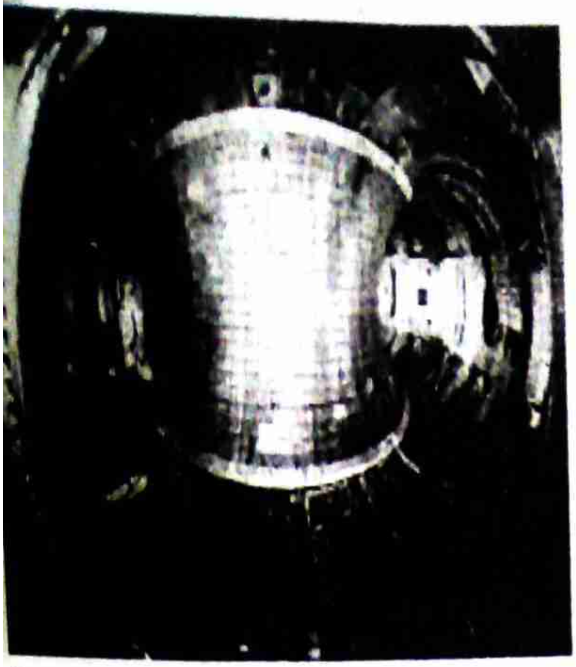
The strong magnetic fields associated with sunspots were detected by means of the Zeeman effect. Sunspots appear dark because they are cooler than the rest of the solar surface, although quite hot themselves. The number of spots varies in an 11-year cycle, and a number of terrestrial phenomena follow this cycle.

CHAPTER 7

CHAPTER 11

Nuclear magnetic resonance is the basis of a high-resolution method of imaging body tissues. The screen shows a computer-constructed cross section of the head of the person lying inside the powerful magnet at the rear.

CHAPTER 12



Interior of the Tokamak Fusion Test Reactor at the Princeton Plasma Physics Laboratory. In December 1993 this reactor produced 6.2 MW of fusion power for 4 s from a deuterium-tritium plasma confined by strong magnetic fields.

CHAPTER 13

Aerial view of CERN, the European particle physics laboratory near Geneva, Switzerland, where many important discoveries were made. A tunnel 27 km in circumference under the large circle will contain the new Large Hadron Collider in which protons and antiprotons will move in opposite directions as they are accelerated to the highest energies yet achieved in the laboratory. It is hoped that their interactions will shed light on the process that gives particles mass. The smaller circle marks an earlier proton-antiproton collider.

CHAPTER 14

Horse head nebula. The horse head nebula, about 1500 light years away in the constellation of Orion. Nebular are interstellar clouds of dust, gas and plasma which are often star forming regions. Study of the emission from nebular gives us vital information about the early stages of star formation.

CHAPTER 15

Radioisotopes and Radiophysics: Particle Accelerator: Particle accelerators are essential tools for understanding the nature of matter at the smallest levels. From early van de Graff accelerators to the massive Large Hadron Collider, they have proved to be invaluable in expanding our knowledge of the nature of matter.

APPENDIX