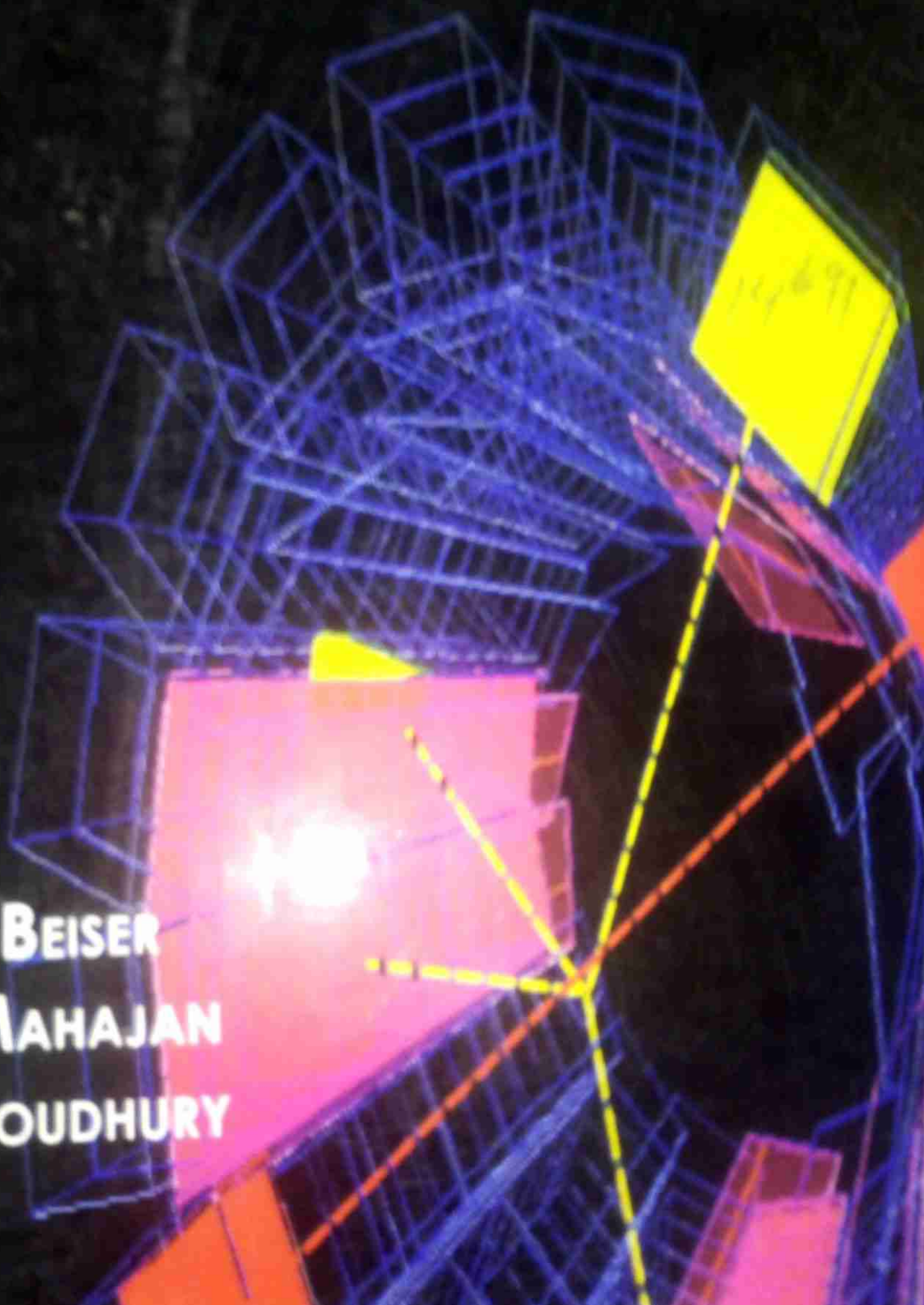


CONCEPTS OF MODERN PHYSICS

7^{ED}



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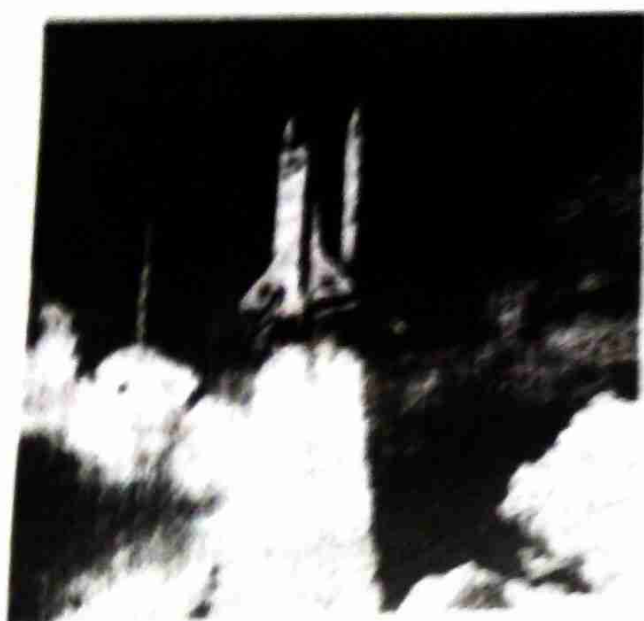
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According to the theory of relativity, nothing can travel faster than light. Although today's spacecraft can exceed 10 km/s, they are far from this ultimate speed limit.

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All motion is relative; the speed of light in free space is the same for all observers

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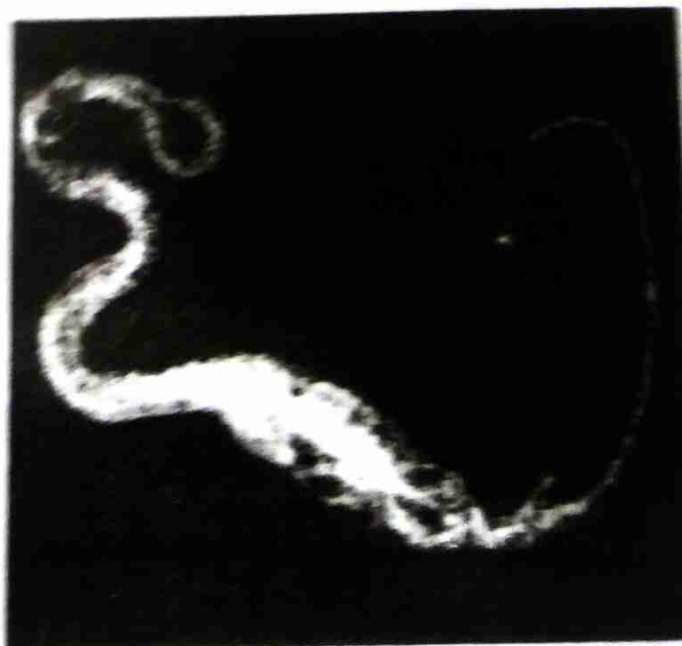
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In a scanning electron microscope, an electron beam that scans a specimen causes secondary electrons to be ejected in numbers that vary with the angle of the surface. A suitable data display suggests the three-dimensional form of the specimen. The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

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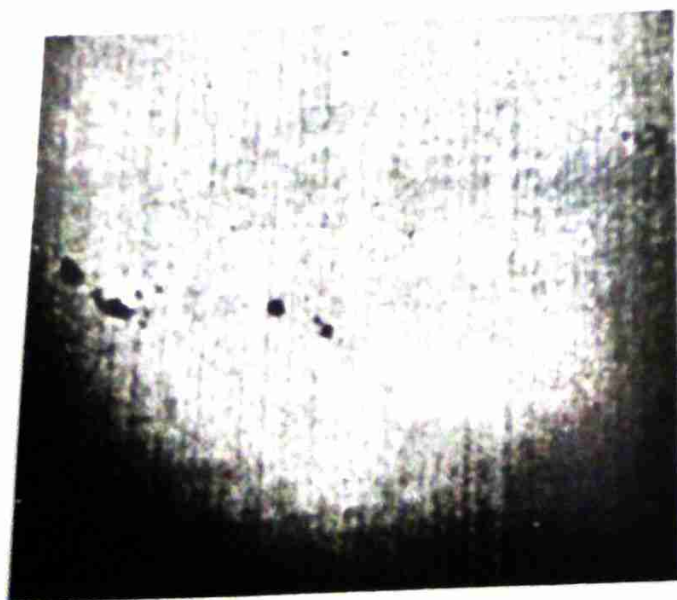
Scanning tunneling micrograph of gold atoms on a carbon (graphite) substrate. The cluster of gold atoms is about 1.5 nm across and three atoms high.

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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.

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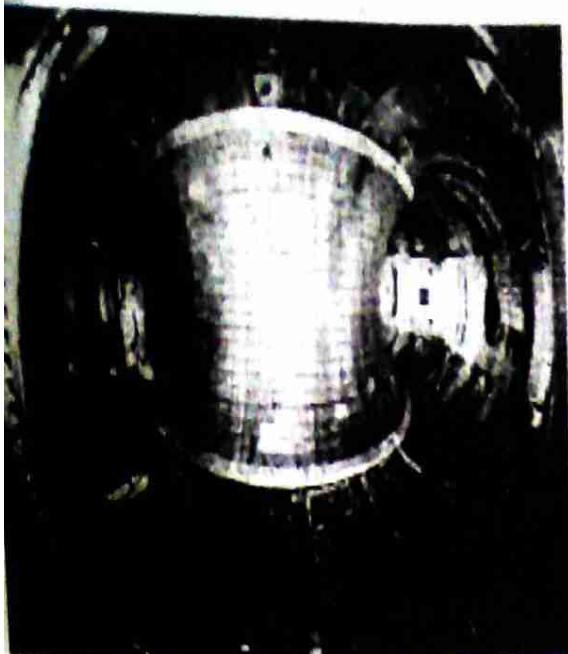
Nuclear magnetic resonance is the basis of a high-resolution method of imaging body tissues. The screen shows a computer-constructed cross section of the head of the person lying inside the powerful magnet at the rear.

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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.



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.

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*"In my beginning is my end."
(T. S. Eliot, Four Quartets)*

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

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