



## **The Physical Universe, 17<sup>th</sup> edition**

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### **A STUDENT-FOCUSED REVISION**

For the seventeenth edition, real student data points and input, derived from thousands of our LearnSmart users, were used to guide the revision. LearnSmart Heat Maps provided clear visual snapshots of usage of portions of the text and the relative difficulty students experienced in mastering the content. With these data, the text content was honed:

- If the data indicated that the subject covered was more difficult than other parts of the book, as evidenced by a high proportion of students responding incorrectly to LearnSmart probes, the text content was substantively revised or reorganized to be as clear and illustrative as possible.
- When the data showed that a smaller percentage of the students had difficulty learning the material, the text was revised to provide a clearer presentation by rewriting the section or providing additional sample problems to strengthen student problem-solving skills.

This process was used to direct many of the revisions for this new edition. Of course, many updates have also been made according to changing scientific data, based on current events and so forth. The following “Changes in This Edition” summary lists the more major additions and refinements.

## CHANGES IN THIS EDITION

- The entire book was brought up to date and new material was added where appropriate. More than 700 changes were made, of which the principal ones are the following:
- There are 78 new photographs, and new or revised drawings throughout the text.
- Section 1.1 on the scientific method was revised and Sec. 1.12 on the SI system was updated.
- Section 2.14 on artificial satellites was updated.
- Sections 3.5, 3.8, and 3.10 respectively on energy conservation, linear momentum, and angular momentum were all revised.
- Chapter 4, whose 14 sections consider every aspect of the energy problem (including population pressures, energy supply, climate change, pros and cons of energy sources, and strategies to protect the environment), was almost entirely rewritten with about 200 changes that provide updates and greater coverage.
- Sections 6.11 and 6.19 on electricity transmission were revised and updated.
- Chapter 8 on the atomic nucleus and nuclear energy was completely updated.
- Sections 10.3, 10.10, and 10.11 respectively have new sidebars on molecules, atomic sizes, and salt.
- Section 11.1 has a new sidebar on liquids, the sidebar on forms of carbon was revised, and Sec. 11.13 now considers ocean acidification.
- Section 12.6 was revised for greater clarity and Sec. 12.13 on electrochemical cells was updated and has a new sidebar on lithium-ion batteries.
- Section 13.10 on plastic waste and Sec. 13.17 on the origin of life were both updated.
- Section 14.1 on air pollution was revised and updated.
- Section 15.15 on volcanoes was revised.
- Chapter 16 on the evolving earth was revised and updated and has a new sidebar on whales.
- Chapter 17 on the solar system was entirely revised and updated with more material on the possibility of life elsewhere on other planets and their satellites.
- Section 18.1 on telescopes was updated and Sec. 18.16 has a new sidebar on gravitational waves.
- Chapter 19 on the universe was revised and updated with more attention on exoplanets and the possibility of life on them.