ERRATA:

Unfortunately, it is impossible to publish a book without errors. We try to keep an updated list of errors, and welcome all contributions.

Figure captions for Front and Back cover were omitted:

Front Cover: Artist conception of a protoplanetary disk. A growing giant planet appears in the foreground (lower right). This planet has a massive atmosphere, and it has partially cleared a gap around its orbit via gravitational torques (see Chapters 11 and 12). It is accreting both gas and small planetesimals, which shed material as they fall into its atmosphere and look like comets. Numerous lunar-sized planetary embryos within the disk are visible through the gravitational wakes that they create in the disk of small planetesimals. A pair of these bodies has just collided and glows red. The star at the center of the disk is in its final stages of accretion, and is expelling gas through a bipolar wind. The disk near the star is warmed by both starlight and viscous dissipation within the disk itself; both processes provide more energy closer to the center of the disk. The blue shading of the outer disk is intended to give the impression of cool temperatures, but in reality such regions would appear dark red; similarly, the radially symmetric structure in the disk has been exaggerated in order to convey the impression of rotation. The top of the painting shows other young stars and interstellar gas and dust that inhabit the same stellar nursery as the star/disk system seen close-up. Painted by Lynette Cook, with scientific consultation of Jack Lissauer.

Back Cover: Many views of Saturn. The top left shows a papercut (by Kay Weber) of Saturn with the mythical depiction of Kronos, the Greek god of agriculture which is identified with this planet; note that the planet's spectacular rings were not discovered until the 17th century C.E. The top center panel is a drawing by Cassini (1676), where he marked the Division in the rings that now bears his name. The top right shows a false-color radio image of Saturn taken with the Very Large Array radio telescope (VLA) at a wavelength of 6 cm in 1986 (de Pater and Dickel, 1991). In contrast to images at visible wavelengths, we receive thermal blackbody radiation from the planet at radio wavelengths (Chapters 3 and 4). The planet shows a warm band, where lower atmospheric opacity enables us to probe deeper, warmer layers in the atmosphere. The classical rings are visible primarily because they scatter Saturn's radio emission. The lower two panels show Hubble Space Telescope images of Saturn and its rings taken in 1998 and in 2000, after the rings had opened up substantially as seen from the Sun and Earth. The background picture in the center is a close-up image of the central portion of Saturn's A ring taken by the Voyager spacecraft; the dark feature slanting down from the upper right is a spiral bending wave excited by the moon Mimas, propagating inwards towards Saturn, which is far off to the right of this image. A spiral density wave, also excited by Mimas, is seen faintly on the left propagating outwards, away from the planet. Numerous narrow unresolved spiral density waves are excited by small moons orbiting just exterior to the ring system. This close-up image is displayed with higher contrast as Figure 11.20.

We indicate "change to" by →, and insert with < insert this >

p. 6 column 2, line 2, replace know → known

p. 8 Table 1.3: Jupiter: rotation period: 9 h 55 m 29.6854s (instead of 27.3 s)
p. 8 Table 1.4: Io: eccentricity is 0.0041 (instead of 0.041)

p. 8: the semimajor axes of Janus and Epimetheus are both 151.46
The semimajor axis of Helene is 377.71

p. 26, Fig. 2.6: in the Caption: change $\log\gamma \rightarrow 0$
if $\log t \rightarrow \infty$ to: $\gamma \rightarrow 0$ if $t \rightarrow \infty$

p. 30, Midway through first full paragraph: the ϖ and *lambda* should
be replaced by $\varpi_{\rm E}$ and $\lambda_{\rm E}$.
Each of these symbols appears twice.
Note that the symbols λ_Ψ should remain as is.

p. 33, third line of the right hand column:
the moment of inertia ratios are in Table 6.2, not 6.1.

p. 35, right column, 8 lines from bottom:
replace Problem 2.31 → Problem 2.32

p. 35, eq. (2.46): replace: $\frac{F_{rad}}{F_g} \rightarrow |\frac{F_{rad}}{F_g}|$

p. 37, eq. 2.49b: the last symbol $\hat{\theta}$ should be bold.

p. 40, problem 2.5.I → 2.5.**I**

p. 42 problem 2.26, towards the end:
replace "Q/k could have been much less in the past"
→ "Q/k could have been much greater in the past"

p. 43. Problem 2.31 should be **I** problem.

p. 44 part (a), calculate the change < in semimajor axis > during
one orbit

p. 45 column 1, after equation 3.1:
replace: number of particles per unit volume
→ number of particles

p. 58, right column: Section 3.2.3.1, line 5:
replace $dz \rightarrow \Delta z$

p. 68 figure 4.1a, On the temperature scale,
replace: 1000 → 1100
and the second 0 on the temperature scale by 1000

p. 71, right column, Fig. caption to Fig. 4.2., line 11:
replace: reduced solar flux and enhanced dust storm →
enhanced solar flux and dust storm

p. 71, right column, just above 4.2.2.2:
replace 500-600 km → $\sim$ 800 km

replace 175 K $\rightarrow \sim$ 180 K (twice)

p. 75, right column: equation just above 4.3.2.2:
replace mc in denominator $\rightarrow m_e c$

p. 82, Fig. 4.8. On middle panel, delete noon (after 8:30 AM)

p. 92, right column: eq. 4.20
replace $R_{gas}T \rightarrow (R_{gas}T)$

p. 94 Section 4.4.3.1, line 9: replace: chorine $\rightarrow$ chlorine

p. 94, Section 4.4.2.2 should read:

4.4.2.2 Formation and Precipitation

Clouds are often related to precipitation: Droplets and ice crystals fall under the influence of gravity, while atmospheric viscosity resists free fall. When these forces balance, the water droplets fall at the *terminal velocity*, v_∞. For particles that are larger than the mean free path of the gas molecules, the terminal (or *sedimentation*) velocity is given by equating Stokes drag to gravity (Section 2.7.5):

$$v_\infty = \frac{2 g_p \rho_d \pi R^2}{9 \nu_v \rho_g} \ , \tag{4.23}$$

where ρ_d and ρ_g are the density of the particle and the atmosphere, respectively, R the particle's radius, and ν_v the kinematic viscosity; $\nu_v \rho_g$ is the dynamic viscosity of the atmosphere. The terminal velocity is proportional to the size (R^2) of the rain drops. Particles much smaller than the mean free path of the gas molecules feel less drag, while the fall velocity of typical raindrops, a few millimeters in size, is strongly affected by turbulence, so that eq. (4.23) should be modified (see e.g. Jacobson, 1999).

p. 98, right column, top paragraph:
replace 38 $\rightarrow$ 20

Several errors on p. 101:
eq. (4.44, 4.45, 4.47) should read:

$$\mathbf{v} = \frac{1}{\rho f_C} (\hat{\mathbf{z}} \times \nabla P) \ . \tag{4.44}$$

$$\frac{D\mathbf{v}}{Dt} = \frac{Dv}{Dt}\hat{\mathbf{t}} + v\frac{Ds}{rDt}\hat{\mathbf{n}} \ , \tag{4.45a}$$

$$\frac{D\mathbf{v}}{Dt} = \frac{Dv}{Dt}\hat{\mathbf{t}} + \frac{v^2}{r}\hat{\mathbf{n}}, \tag{4.45b}$$

$$\frac{Dv}{Dt} = -\frac{1}{\rho}\frac{\partial P}{\partial s} \ , \tag{4.47}$$

p. 112 After equation 4.57, line 3, solar flux density expressed

in photons cm^{-1}
replace: $\mathrm{cm}^{-1} \rightarrow \mathrm{cm}^{-2}$

p. 113, Fig. 4.33b: Remove the jagged upper line between 0 and 400 nm, at the left of the figure.

p. 114, right column, bottom:
replace chlorineand → chlorine and

p. 115, left column, line 3 below reaction (9b):
replace bromineatoms → bromine atoms

p. 117, Section 4.6.1.4, line 5,
replace: at the other hand → on the other hand

p. 120, second column, second line from below: replace **j** by **J**

p. 122, eq. 4.71, replace j by J:

$$Q_J = \mathbf{J}_\perp \cdot \mathbf{E}_\perp = \frac{J_\perp^2}{\sigma_c} \,, \tag{4.71}$$

p. 125: first column, halfway down: replace: $(1/N_i)(dN_i/dz)$ by:
$(1/N_i)(\partial N_i/\partial z)$

p. 125, second column: second line: replace: dN_i/dz by $\partial N_i/\partial z$

p. 135, problem 4.17:
replace $\nu_v = 0.134$ cm s^{-1} →
$\nu_v = 0.134$ cm^2 s^{-1} and $\rho_{air} = 1.293 \times 10^{-3}$ g cm^{-3}
in a): replace 100 → 0.1
in b): replace 1 cm → 10 μm

p. 146, Fig. 5.6: Replace Y-axes:
$-R_{gas}\ln f_A \rightarrow -R_{gas}T\ln f_A$
$-R_{gas}\ln f_B \rightarrow -R_{gas}T\ln f_B$

p. 148, Fig. 5.8. Replace within figure: 1850 → 2123; 1557→ 1830;
Along right Y-axis: add 273 K to the numbers.
1695 → 1968; 1543 → 1816; 1470 → 1743
In caption, replace: Putnis → adapted from Putnis

p. 155, Fig. 5.17: Delete last line: The picture is 125 x 160 km.
(This krept in from caption 5.18)

p. 159 column 2, line 6, hypersonic (< much > faster than the speed of sound) impacts

p. 171 After equation 5.29, where $< N_{cum}$ is expressed in $\mathrm{km}^{-2} >$

p. 210 Problem 5.4. insert: $+12.525 \times 10^{10}$
$<$ erg $\mathrm{mol}^{-1} >$

p. 220, eq. 6.22: replace $q^n \rightarrow q_r^n$
several places where $q \rightarrow q_r$

p. 272, Just above Section 7..3.4: replace corotational with convection

p. 295, Fig. 7.40, Caption (b,c) An expanded view of the SL impact
replace SL → SL9

p. 307, last words of the epigraph, replace: from from → from

p. 315, Fig. 8.9: Pribram is 1959 NOT 1939.

p. 316 equation 8.3b: The right side of the equation should
have a square root sign.

p. 317 column 1, line 9:
replace: boloid → bolide
line 16: replace: boloids → bolides

p. 321 Section 8.5.4.2, line 6: insert:
($t_{1/2} = 720,000$ years for $<$ inverse $>$ β
decay into ^{26}Mg)

p. 329: Element 118: the claim of its discovery has now been withdrawn.
Change Problem 8.12: 114, 116 and 118 → 114 and 116

p. 331 After equation 9.1, line 4,
replace: (Fig. 9.1b) → (Fig 9.1c)

p. 332, Table 9.1. Change the following headings:
Period (yr) → Orbital Period (yr)
Rotation (hr) → Rotation Period (hr)

p. 333 column 2, line 2, replace: Cruithe → Cruithne

p. 353. right column, paragraph starting with M type asteroids:
replace (i.e., water in all the forms of hydrated minerals) →
(i.e., water in the form of hydrated minerals)

p. 359 column 2, last line, insert:
that the pair is less than 10^8 years $<$ old $>$,

p. 362, Problem 9.1: line 1: replace: Fig. 9.1b → Fig 9.1c
Last words on page, replace: Fig. 9.1b → Fig 9.1c

p. 391, eq. 10.19: replace = by ≈

p. 403, Fig. 1.1
add to caption for figure 11.1:
taken from Huygens (1659). I Galileo, 1610; II Scheiner, 1614; III
Riccioli. 1641 or 1643; IV - VII Hevel, theoretical forms; VII, IX Riccioli,
1648-50; X Divini, 1646-48; XI Fontana, 1636; XII Biancani, 1616, Gassendi,
1638-39; XIII Fontana and others at Rome, 1644-45.
The reference is to: Huygens, C. 1659. Systema Saturnium.

p.441, 1st line of 12.2.2: change helium → boron

Chapter 13, Figs. 13.2, 13.4, 13.5, and 13.7: replace credit line
D. Fischer → G.W. Marcy's planet search team

p. 476, Eq. 13.1: kT should be in the numerator, not the denominator.

Table of Symbols:
p. 490, left column:
replace ν_v/ρ absolute viscosity $\rightarrow$ $\nu_v\rho$ dynamic viscosity

p. 493, Remove "(293)" from box 118 in the Periodic Table

p. 510, replace: Cruithe $\rightarrow$ Cruithne