Known Errors in "Solar System Dynamics"
(Last Updated: 4 September 2006)

We did our best to try to eliminate as many errors as possible. However, with more than 1600 equations, some of them quite complicated, errors were bound to occur. Below is our current list of errors, spelling mistakes and typos discovered since the proofs were submitted. Where errors were discovered by people other than the authors we give credit to the person concerned and note the month and year when the error was reported. We also thank Alan Algustyniak and Roy Brown for pointing out errata in the errata!

Please contact the authors if you think you have discovered any additional errors in the book. We cannot offer any financial rewards for doing so but we do promise to acknowledge error finders in this document.

Page xii, Preface (Credit: Kleomenis Tsiganis, June 2000)

The URL for the web address should have been `http://www.cup.cam.ac.uk` although I am sure it used to work without the `www`. However, Cambridge University Press have recently revamped their UK web site. As a result even the *corrected* address points to a "Site Changes" page. The new address for the book is `http://uk.cambridge.org/physics/catalogue/0521575974/`

Page xii, Preface
The latest URL for the UK Cambridge University Press web site can now be found at
`http://www.cambridge.org/uk/catalogue/catalogue.asp?isbn=0521575974`.
The main web site for the book is at `http://ssdbook.maths.qmul.ac.uk/`

Page 20, Question 1.4

The last part of the question asks you to show that there are two additional pairs with $|c| < 0.15$. In fact there is only one additional pair. The last part of the question should read "…there is one additional pair with $|c| < 0.15$."

Page 21, Question 1.6

There are two corrections to part (e) of the question: The satellites of Neptune should be included and the limit on the eccentricity should be 0.15 and not 0.1. The relevant parts of the question should read "…satellites of Mars, Jupiter, Saturn, Uranus and Neptune with mean radii > 100 km and orbital eccentricities < 0.15."

Page 54, Sect. 2.9 (Credit: Tabare Gallardo, October 2001)

In the line following Eq. (2.142) $\bar{T}$ refers to the tranverse force and not the tangential force. This is in keeping with Burns original definition. Therefore the word "tangential" should be replaced by "transverse".

Page 56, Eq. (2.164) (Credit: Ricardo Reis Cordeiro, February 2004 and Todd Humphreys, March 2005)

The sign in front of the C in the first line of Eq. (2.164) should be $-$ and not $+$. The corrected equation is:

$$\begin{aligned}\frac{\mathrm{d}\omega}{\mathrm{d}t} =& 2h\dot{h}\frac{r^{-1} - C(e\mu)^{-1}\cos(\theta-\omega)}{e\mu\sin(\theta-\omega)} \\ &+ \dot{\theta} - \frac{h^2}{e^2\mu^2}\dot{C}\cot(\theta-\omega)\,.\end{aligned} \tag{2.164}$$

Page 57, Sect. 2.10

On the penultimate and last line of this page the phrase "the derivation of Lagrange's equations (Sect. 6.7)," should be removed. Lagrange's equations are discussed in Sect. 6.8 but they are not derived.

Page 65, Sect. 3.2 (Credit: Angela Flynn, March 2000)

The last term on the right-hand side of Eq. (3.7) should be $(\zeta_2 - \zeta)^2$ and not $(\zeta_1 - \zeta)^2$. The corrected equation is:

$$r_2^2 = (\xi_2 - \xi)^2 + (\eta_2 - \eta)^2 + (\zeta_2 - \zeta)^2 \,. \qquad (3.7)$$

Page 66–67, Sect. 3.2 (Credit: Fathi Namouni, October 1999)

There should no apostrophe in "Corioli's". The name of the French mathematician was Gustave Gaspard de Coriolis (see `http://www-history.mcs.st-and.ac.uk/history/Mathematicians/Coriolis.html`). Coriolis was assistant professor of mathematics at the Ecole Polytechnique, Paris from 1816 to 1838. Fathi Namouni attended the same institution.

Page 67, Sect. 3.2 (Credit: Elsa Aristodemou, March 2001)

The first sentence after Eq. (3.22) is a bit confused. Instead of "...and the term in $1/r_2$ and $1/r_2$ is the gravitational potential" the middle part of the sentence should be: "...and the terms in $1/r_1$ and $1/r_2$ are the gravitational potentials".

Page 71, Sect. 3.4 (Credit: Shafi Ahmed, May 2001)

The first paragraph of Sect. 3.4 ends with the sentence, "In this system we can use Eq. (3.37) to write the Jacobi constant as ...". In fact, Eq. (3.40) is identical to Eq. (3.36). So while it is true that Eq. (3.40) can indeed be derived from Eq. (3.37) it would have been more appropriate to write, "In this system we can write the Jacobi constant as ..." or even to remove Eq. (3.40) completely.

Page 72, Sect. 3.4 (Credit: Kees de Pooter, September 2001)

In the last line of p. 72 the increase is given as "almost 8 AU". It should be "almost 6 AU". This is now compatible with the subsequent statement on p. 73 that $a = 4.81$ AU and $a' = 10.8$ AU.

Page 89, Sect. 3.7 (Credit: Kees de Pooter, September 2001)

The last sentence before Eq. (3.125) needs to be modified slightly. It is the first equation in Eq. (3.101) that is being used and we need expressions for X, Y, $\dot{Y}$ and $\ddot{X}$ taken from Eq. (3.123), Eq. (3.124) and the derivative of the expression for $\dot{X}$ in the second part of Eq. (3.123). The sentence should now read "Substituting the expressions for X, Y, $\dot{Y}$, and $\ddot{X}$ into the first part of Eq. (3.101) we have ...".

Page 92, Sect. 3.7.1 (Credit: Cesar Ocampo, October 2002)

In the first sentence of the last paragraph of this section the word "stable" should be removed. *SOHO* has been placed on an *unstable*, periodic orbit at the L_1 point but small amounts of fuel have to be expended to keep it at this location. The relevant part of the corrected sentence should read: "...it is possible to find periodic orbits in the vicinity ...".

Page 107, Sect. 3.10 (Credit: Kees de Pooter, November 2001)

The value of $\theta_{\min}$ should be 23.9° and not 23.5° as stated in the text. The same error occurs in Question 3.1 on page 128.

Page 108, Sect. 3.11

The reference to the paper by Christou should now read "Christou (2000)" rather than "Christou (1999)". The full reference is now listed below under References C.

Page 113, Sect. 3.12 (Credit: Kees de Pooter, November 2001)

Eight lines from the bottom of the page the mean semi-major axis of Janus Epimetheus is given as 150,432 km. The number should be 151,432 km and the values for the individual semi-major axes listed in Table A.9 on page 533 are now consistent with the mean value and the stated variations.

Page 126, Eqs. (3.245)–(3.246)

There are mistakes in the values given in Eq. (3.245) that propagate to the value of a_1 given in Eq. (3.246). The changes do not affect the result that the points are linearly unstable to PR drag. The correct values of a_1 and a_3 are now consistent with the more general result quoted in Eq. (3.253) with $i = 0$ and $j = -2$. The corrected equations are:

$$k_{x,\dot{x}} = k_{y,\dot{y}} = \frac{k}{2}, \quad k_{x,y} = k_{y,x} = k \tag{3.245}$$

and hence

$$a_1 = 3k, \qquad a_3 = -2k. \tag{3.246}$$

Page 128, Question 3.1

The angular separation of the curves should be 23.9° and not 23.5°.

Page 129, Question 3.6

The quantities $\mathbf{r}$ and $\mathbf{v}$ are the position and velocity vectors in the inertial frame. This is consistent with the use in Sect. 3.14.2 even though we used $\mathbf{v}$ rather than $\mathbf{V}$. Furthermore, the theory referred to can be found in Sect. 3.14.2 and not Sect. 3.15.2.

Page 146, Eq. (4.81) (Credit: Francis Nimmo, April 2006)

The denominator in the fact outside the parentheses on the right-hand side of this equation should be 5σ and not 5ρ. The corrected equation is:

$$H = \frac{2\langle\rho\rangle}{5\sigma}\left(\frac{1+\tilde{\mu}+(3/2)(A/B)^2 F\delta}{(1+\tilde{\mu})(\delta+2\sigma/5\rho)}\right) \tag{4.81}$$

Page 150, Eq. (4.103) (Credit: Robin Canup, June 2000)

The a on the right-hand side of Eq. (4.103) should be replaced by 2. The corrected equation is:

$$\Omega_{\max} \approx \left(\frac{\mathcal{G}m_{\mathrm{p}}}{a^3}\right)^{1/2} \approx 2\left(\mathcal{G}\langle\rho\rangle\right)^{1/2} \tag{4.103}$$

Page 151, Sect. 4.5 (Credit: Bruce Bills, June 2000)

On the first line below Eq. (4.106) the phrase "Since $\mathcal{P}_2(\mu)$ is an odd function for odd n" should be replaced by "Since $\mathcal{P}_n(\mu)$ is an odd function for odd n"

Page 151, Sect. 4.5 (Credit: Bruce Bills, June 2000)

In the paragraph below Eq. (4.106) the sentence "In fact, only the Earth has a measured nonzero value of J_3" is incorrect. This is clear from the data given in Yoder (1995). The sentence should be replaced by "In fact, only the Moon, Earth, Mars and Venus have measured nonzero values of J_3".

Page 177, Sect. 4.12 (Credit: Bruce Bills, November 2000)

In Eqs. (4.207) and (4.208) the π should be in the denominator and not the numerator. Furthermore, in Eq. (4.207) the time average of $|\sin^3 nt|$ rather than just $\sin^3 nt$ is the quantity that is being calculated. In Eq. (4.209) there should be an additional factor π in the denominator. This now agrees with eq. (7) of Sagan & Dermott (1982). The three equations should be

$$\langle|\sin^3 nt|\rangle = \frac{4}{3\pi} \tag{4.207}$$

$$\langle\sin^3 2\beta\rangle = \frac{2}{\pi}\int_0^{\pi/2} \sin^3 2\beta \sin\beta \, \mathrm{d}\beta = \frac{32}{35\pi} \tag{4.208}$$

$$\langle v^3\rangle = \frac{2}{105\pi^2}\left[nC_\mathrm{s}\left(\frac{3eh}{D}\right)\right]^3 \tag{4.209}$$

Page 180, Sect. 4.13 (Credit: Dimitri Veras, February 2003 and Ozgur Karatekin, April 2006)

In the sentence immediately before Eq. (4.220) the referenced equation should be Eq. (4.214) and not Eq. (4.24). The corrected sentence should be: "From Eq. (4.214) we have ...".

Page 186, Question 4.2

In part (a) the fractional core radius should be defined as $x = R_\mathrm{c}/R$ and not as $x = r_\mathrm{c}/R$. The same error occurs in part (b) where the radius of the Earth's core should be R_c = 3,480 km and not r_c = 3,480 km.

Page 187, Question 4.4

In order to derive an expression for the inclination damping timescale you need to make use of a result from Peale *et al.* (1979). This states that for a synchronous satellite on a circular, inclined orbit, the rate of dissipation of tidal energy within the satellite is given by $\dot{E} = -\left(\mathcal{G}m_\mathrm{p}^2 R_\mathrm{s}^5 n/a^6\right)(k_2/Q)_\mathrm{s}\,(3/2)\sin^2\epsilon$ where m_p is the mass of the planet, R_s is the radius of the satellite and ϵ is the obliquity of the satellite's spin axis.

Page 189, Sect. 5.2 (Credit: Atakan Gurkan, July 2006)

On the last line of this page the reader is referred to Sect. 4.5. It should be Sect. 4.10. The corrected sentence is: "...in a 2:1 ellipse (cf. Sect. 4.10) as ...".

Page 193, Eq. (5.8) (Credit: Angela Flynn, February 2003)

There are several approximations in Eq. (5.8) and the second and third equality signs should be replaced by $\approx$. The corrected equation is:

$$\sin\delta = \cos f \approx \cos(nT + 2e\sin nT) \approx \cos nT - 2e\sin^2 nT. \tag{5.8}$$

Page 198, Eq. (5.47) (Credit: Mike Austin, March 2001)

The subscript on the left-hand side of Eq. (5.47) should be y and not x. The corrected equation is:

$$\mathcal{B}\dot{\omega}_y - (\mathcal{C} - \mathcal{A})\omega_z\omega_x = N_y \tag{5.47}$$

Page 201, Figure 5.8

There should be a line joining the planet to the point O at the centre of the satellite.

Page 205, Eq. (5.88) (Credit: Dimitri Veras and Angela Flynn, February 2003)

The $-$ sign in the denominator of Eq. (5.88) should not be there. The corrected equation is:

$$\gamma_0 = \frac{1}{2}\sin^{-1}\left[\frac{2\langle N_{\rm s}\rangle}{[\operatorname{sign} H(p,e)]\omega_0^2\mathcal{C}}\right] \tag{5.88}$$

Page 209, Sect. 5.4 (Credit: Angela Flynn, February 2003)

The sentence immediately prior to Eq. (5.95) incorrectly refers to Eq. (5.79) when it should refer to Eq. (5.87), the strength criterion. The beginning of the sentence should now be: "From the strength criterion, Eq. (5.87) and Eq. (5.2), we calculate that ...".

Page 214, Eq. (5.110) (Credit: Angela Flynn, February 2003)

There is an error in the expression inside the summation in the denominator of Eq. (5.110). To agree with the definition of W in Eq. (5.102) we must have $H(h,e)$ instead of $H(p,e)$. The corrected equation is:

$$P_p = \frac{2Z}{Z+W} = \frac{2\,[H(p,e)]^2}{[H(p,e)]^2 + \sum_{h\neq p}[H(h,e)]^2\ \operatorname{sign}(p-h).} \tag{5.110}$$

Page 218, Figure 5.17 (Credit: Angela Flynn, February 2003)

There are only five different trajectories in Fig. 5.17b and not seven as stated in the caption. The corrected part of the caption should now be: "(b) A surface of section plot for five different trajectories in ...".

Page 222, Question 5.1

The spin period of Mercury is 58.65 days, not 56 days as stated in the question. Note also the correction to the spin period listed in Appendix A, Table A.4.

Page 226, Figure 6.1 (Credit: Elsa Aristodemou, July 2001)

There is an error in the figure legend. In the second sentence of the legend the symbols $\mathbf{R}$ and $\mathbf{R}'$ should be replaced by $\mathbf{R}_i$ and $\mathbf{R}_j$. The second sentence should now be: "The three masses have position vectors $\mathbf{R}_i$, $\mathbf{R}_j$ and $\mathbf{R}_\mathrm{c}$ with respect to an arbitrary, fixed origin, O."

Page 226, Sect. 6.2 (Credit: Doug Hamilton, October 2001)

In the phrase immediately following Eq. (6.2) insert the word "new" before "coordinate system" to avoid confusion with the point O. The corrected phrase is: "and the primary is the origin of the new coordinate system (see Fig. 6.1)."

Page 229, Eq. (6.23 (Credit: Tabare Gallardo, October 2001)

The term μ/r' needs to be added to the right-hand side of Eq. (6.23) to account for the fact that the term arising from $l = 0$ in the summation is a function of the orbital elements of the perturbed (external) body. The new equation should be:

$$\mathcal{R}' = \frac{\mu}{r'} \sum_{l=2}^{\infty} \left(\frac{r}{r'}\right)^l P_l(\cos\psi) + \frac{\mu}{r'} + \mu \frac{r}{r'^2}\cos\psi - \mu\frac{r'}{r^2}\cos\psi. \tag{6.23}$$

Furthermore, the word "two" needs to be replaced by "three" in the following sentence. This should now start "Thus, apart from three extra terms. . . "

Page 238, Eq. (6.76)

There is an error in the third sine term associated with e^2. It should be $\sin[M-\omega]$ and not $\sin[\omega - M]$. The corrected equation is:

$$\begin{aligned} \sin[\omega + f] &= \sin\omega\cos f + \cos\omega \sin f \\ &\approx \sin[\omega + M] + e\left(\sin[\omega + 2M] - \sin\omega\right) \\ &\quad + e^2\left(-\sin[\omega + M] + \frac{1}{8}\sin[M-\omega] + \frac{9}{8}\sin[\omega + 3M]\right) \end{aligned} \tag{6.76}$$

Page 242, Eq. (6.93)

There is an error in the partial derivative. The second derivative in the denominator should be $\partial a'^n$ and not $\partial a'^m$. The corrected equation is:

$$a^i a'^{i+1} A_{i,j,m,n} = a^{i+m} a'^{i+n+1} \frac{\partial^{m+n}}{\partial a^m \partial a'^n}\left(a'^{-(2i+1)} b^{(j)}_{i+\frac{1}{2}}(a/a')\right). \tag{6.93}$$

Page 242, Eq. (6.99)

On the left-hand side the third suffix of A should be 0 and not 2. On the right-hand side, second line, the last term in parentheses should be 1 not 2. The corrected equation is:

$$\begin{aligned} a^i a'^{i+1} A_{i,j,0,2} &= \alpha^{i+2} D^2 b^{(j)}_{i+\frac{1}{2}}(\alpha) + 4\alpha^{i+1}(i+1) D b^{(j)}_{i+\frac{1}{2}}(\alpha) \\ &\quad + 2\alpha^i(2i^2 + 3i + 1) b^{(j)}_{i+\frac{1}{2}}(\alpha). \end{aligned} \tag{6.99}$$

Page 242, Eq. (6.100)

There is a missing factor $\frac{1}{2}$ in two terms on the second line. The corrected equation is:

$$\begin{aligned}\mathcal{R}_{\mathrm{D}} = \Bigg(&\frac{1}{2}\big[a' A_{0,j,0,0} + \varepsilon a' A_{0,j,1,0} + \varepsilon' a' A_{0,j,0,1} \\ &\quad + \frac{1}{2}\varepsilon^2 a' A_{0,j,2,0} + \varepsilon\varepsilon' a' A_{0,j,1,1} + \frac{1}{2}\varepsilon'^2 a' A_{0,j,0,2}\big] \\ &+ \left(\frac{1}{2}\frac{r}{a}\frac{r'}{a'}\Psi\right) a a'^2 A_{1,j,0,0}\Bigg)\cos j[\theta - \theta'].\end{aligned} \tag{6.100}$$

Page 243, Eq. (6.104)

There are errors in the first two cosine arguments. The first argument should have been $(2+j)\lambda - j\lambda' - 2\varpi$ and not $(2+j)\lambda - j\lambda - 2\varpi$. The second argument should have been $(2-j)\lambda + j\lambda' - 2\varpi$ and not $(2-j)\lambda + j\lambda - 2\varpi$. There are also errors in the coefficients associated with the third and fourth cosine arguments in $\mathcal{R}_{\mathrm{D}}^{(2)}$. In each case the $2j\alpha D$ term should be $4j\alpha D$. The corrected first four terms in the equation are:

$$\begin{aligned}\mathcal{R}_{\mathrm{D}}^{(2)} = &\left(\frac{1}{16}e^2\left[5j + 4j^2 - 2\alpha D - 4j\alpha D + \alpha^2 D^2\right] b_{\frac{1}{2}}^{(j)}\right) \\ &\times \cos[(2+j)\lambda - j\lambda' - 2\varpi] \\ &+ \left(\frac{1}{16}e^2\left[-5j + 4j^2 - 2\alpha D + 4j\alpha D + \alpha^2 D^2\right] b_{\frac{1}{2}}^{(j)}\right) \\ &\times \cos[(2-j)\lambda + j\lambda' - 2\varpi] \\ &+ \left(\frac{1}{8}ee'\left[2j - 4j^2 - 2\alpha D + 4j\alpha D - \alpha^2 D^2\right] b_{\frac{1}{2}}^{(j)}\right) \\ &\times \cos[(1+j)\lambda + (1-j)\lambda' - \varpi - \varpi'] \\ &+ \left(\frac{1}{8}ee'\left[-2j - 4j^2 - 2\alpha D - 4j\alpha D - \alpha^2 D^2\right] b_{\frac{1}{2}}^{(j)}\right) \\ &\times \cos[(1-j)\lambda + (1+j)\lambda' - \varpi - \varpi']\end{aligned}$$

Page 245, Eq. (6.109)

There is an error on the left-hand side of Eq. (6.109). The expression should be $(a'/r')^2$ and not (a'/r'). The corrected equation is:

$$\left(\frac{a'}{r'}\right)^2 = 1 + 2e'\cos[\lambda' - \varpi'] + \frac{1}{2}e'^2\left(1 + 5\cos[2\lambda' - 2\varpi']\right) \tag{6.109}$$

Page 246, Eq. (6.110)

There is an error in one of the arguments on the right-hand side of Eq. (6.110). The argument of the ninth cosine term should be $2\lambda' - \varpi' - \varpi$ and not $2\lambda - \varpi' - \varpi$. Therefore the corrected fifth line of the expansion should be

$$+3ee'\cos[2\lambda' - \varpi' - \varpi] - \frac{1}{8}e'^2\cos[\lambda' + \lambda - 2\varpi']$$

Page 248, Eq. (6.126) (Credit: Kleomenis Tsiganis, June 2000)

In the definition of j the $\bar{a}$ should be replaced by l. (One of the summations in Eq. (6.113) is from $l = 0$ to $l = i - s$.) This is now consistent with the conclusion that $l = 0$ for the specific example given in Sect. 6.10.2 on page 263. The corrected Eq. (6.126) should be

$$j = |j_2 + i - 2l - 2n - 2p + q| . \qquad (6.126)$$

Page 251, Eq. (6.143) (Credit: Kleomenis Tsiganis, November 2000)

In the last part of Eq. (6.143) the power of e' should be $|j_3|$ and not $|j'_3|$. The corrected Eq. (6.143) should be

$$S \approx \frac{f(\alpha)}{a'} e^{|q|} e'^{|q'|} s^{|m-l+2p|} s'^{|m-l+2p'|} = \frac{f(\alpha)}{a'} e^{|j_4|} e'^{|j_3|} s^{|j_6|} s'^{|j_5|} . \qquad (6.143)$$

Page 251, Sect. 6.8 (Credit: Kleomenis Tsiganis, June 2000)

In line 3 of the first paragraph there is a missing "of". The third sentence should be "To do this we make use of *Lagrange's planetary equations.*"

Page 251, Sect. 6.8

In line 1 of the second paragraph "require" should be replaced by "requires".

Page 251, Eq. (6.147) (Credit: Kleomenis Tsiganis, November 2000)

The first term in the right-hand side of Eq. (6.147) the R should be replaced by $\mathcal{R}$. The corrected Eq. (6.147) should be

$$\frac{\mathrm{d}\epsilon}{\mathrm{d}t} = -\frac{2}{na}\frac{\partial \mathcal{R}}{\partial a} + \frac{\sqrt{1-e^2}(1-\sqrt{1-e^2})}{na^2 e}\frac{\partial \mathcal{R}}{\partial e} + \frac{\tan\frac{1}{2}I}{na^2\sqrt{1-e^2}}\frac{\partial \mathcal{R}}{\partial I} . \qquad (6.147)$$

Page 252, Sect. (6.8) (Credit: Greg Novak, February 2002)

In the last sentence of the penultimate paragraph ϵ should be replaced by ϵ^*. The corrected sentence is: "In practice the variation of ϵ^* can usually be neglected since it is a small effect."

Page 253, Sect. 6.9

In the second paragraph there is a comment about the origin of the word "secular". The Latin word *saeculum* is, of course, a noun and not a verb. Replace "verb" by "noun".

Page 253, Eq. (6.159) (Credit: Elsa Aristodemou, July 2001)

There is an error in the subscripts in this equation which means that j_1 and j_2 need to be interchanged. The equation should be:

$$a \approx (|j_2|/|j_1|)^{\frac{2}{3}} a' . \qquad (6.159)$$

Compare this with Eq. (8.24) using the values of $j_1 = p + q$ and $j_2 = -p$.

Page 266, Sect. 6.11 (Credit: Bruce Bills, June 2000)

The statement "If i is even then the J_i are called zonal harmonics" is incorrect. The statement should be replaced by "The J_i are called zonal harmonics". Bruce Bills has pointed out that all of the J_i's are zonal coefficients, which simply means that they have no longitude dependence. To complete the taxonomy, harmonics which have zeroes only at the poles are called *sectoral harmonics*, and those which have a checkerboard pattern of nodal lines are called *tesseral harmonics*. This is discussed on page 116 of Danby (1988).

Page 266, Sect. 6.11 (Credit: Tabare Gallardo, October 2001)

Known values for J_2 and J_4 are listed in Table A.4 not Table A1.4. Therefore on the second line "Table A1.4" should be replaced by "Table A.4".

Page 271, Question 6.2

It should be pointed out that in the differential equation for F, the quantity x is α^2. Also, the task of solving for the coefficients becomes impossible unless s is specified. Therefore, the sentence "Derive expressions for A_l and B_l" should be replaced by "Taking $s = 3/2$, derive expressions for A_l and B_l". Finally, in the equation for $F(\alpha^2)$ the coefficients should be A_l and B_l, and not a_l and b_l, repectively. This is in keeping with the notation used in the definition $G(y)$. Therefore the corrected equation should be

$$F(\alpha^2) = \sum_{l=0}^{\infty} A_l (1-\alpha^2)^{l-2s+1} + \ln(1-\alpha^2) \sum_{l=0}^{\infty} B_l (1-\alpha^2)^l .$$

Page 272, Question 6.4

In the second part of the question you should combine your answer with the expression for $\mathrm{d}\omega/\mathrm{d}t$ and not $\mathrm{d}\varpi/\mathrm{d}t$ as stated in the question. Furthermore, although $\mathrm{d}\omega/\mathrm{d}t$ is not given in Sect. 6.11, it is relatively easy to show that $\mathrm{d}\omega/\mathrm{d}t = \left(3nJ_2R^2\right)\left(1-(5/4)\sin^2 I\right) / \left(a^2(1-e^2)^2\right)$. You should make use of this expression in your answer.

Page 274, Sect. 7.1 (Credit: Kleomenis Tsiganis, June 2000)

On line 4 "Sect. 3" should be replaced by "Chapter 3".

Page 281, Eq. (7.47) (Credit: Doug McNeil, September 2000)

In the first part of Eq. (7.47) there is a mistake in the second element of the array on the right-hand side of the equation. The number −0.375549 should be replaced by −0.0375549. This is a transcription error and it does not propagate. The corrected equation should be

$$\begin{pmatrix} S_1 \sin\beta_1 \\ S_2 \sin\beta_2 \end{pmatrix} = \begin{pmatrix} -0.0308089 \\ -0.0375549 \end{pmatrix} . \tag{7.47}$$

Page 289, Sect. 7.5 (Credit: Kleomenis Tsiganis, June 2000)

In paragraph 2, line 3 "over an" should be replaced by "over and".

Page 296, Eq. (7.110) (Credit: Ricardo Reis Cordeiro, February 2004)

In Eq. (7.110) the sign in front of the e' term on the second line should be + and not −. The corrected equation is:

$$\Delta^{-3} = \frac{1}{2}\frac{1}{a'^3}\sum_{j=-\infty}^{\infty}\left[b_{3/2}^{(j)} - \alpha e \frac{\mathrm{d}b_{3/2}^{(j)}}{\mathrm{d}\alpha}\cos f \right. \\ \left. + e'\left(3b_{3/2}^{(j)} + \alpha\frac{\mathrm{d}b_{3/2}^{(j)}}{\mathrm{d}\alpha}\right)\cos f'\right]\cos j\phi. \tag{7.110}$$

Page 311, Table 7.4 (Credit: Doug Hamilton, October 2001)

In the column heading for the table "$e_{\mathrm{proper}}(°)$" should be replaced by "e_{proper}" because it does not have units.

Page 317, Sect. 7.12 (Credit: Angela Flynn, March 2000)

On the second line of the second paragraph the phrase "all the planets except planets" should be replaced by "all the planets except Pluto".

Page 318, Question 7.1

The quantities μ_1 and μ_2 are not defined in the question. They are given by $\mu_1 = m_1/(m_\mathrm{s} + m_2)$ and $\mu_2 = m_2/(m_\mathrm{s} + m_1)$ where m_s is the mass of the star.

Page 319, Question 7.6

Table A.9 does not give a mass for Hyperion. For the purposes of this question you should take the mass to be 0.143×10^{20} kg.

Page 328, Sect. 8.3 (Credit: Doug Hamilton, October 2001)

In the first sentence of the second paragraph replace "conjunction" with "conjunctions".

Page 331, Sect. 8.4 (Credit: Elsa Aristodemou, July 2001)

The sentence starting "It is clear from Eq. (8.23) ..." should be replaced by "It is clear from Eq. (8.22) ...".

Page 333, Eq. (8.35)

There is an obvious(!) problem with Eq. (8.35). It should read:

$$\frac{\mathrm{d}a}{\mathrm{d}e} = -2(j_2/j_4)ae \tag{8.35}$$

Page 333, Sect. 8.5 (Credit: Doug Hamilton, October 2001)

The purpose of discussing the result derived from the Tisserand relation in Eq. (8.37) was to make a comparison with Eq. (8.35) (as corrected above). However, the final comparison was not made. If we take

Eq. (8.37) and make use of the approximate resonant condition $j_1 n' + j_2 n = 0$ then $a^{3/2} - 1 = a^{3/2} - a'^{3/2} = a^{3/2}(1 + j_1/j_2)$. But j_1, j_2 and j_4 satisfy the d'Alembert relation such that $j_1 + j_2 + j_4 = 0$. Hence Eq. (8.37) can be written as $\mathrm{d}a/\mathrm{d}e = -2(j_2/j_4)ae$ which is identical to Eq. (8.35) to this level of approximation. As Doug Hamilton points out, the expressions will not agree to higher order. The Jacobi generalisation includes all long and short period terms to all orders in e, while a generalisation of Eq. (8.35) clearly applies only to the resonant argument.

Page 335, Sect. 8.6 (Credit: Angela Flynn, January 2003)

The sign in the equation on line 4 of the penultimate paragraph should be +, not −. The corrected equation should be $\ddot{\varphi}' = +\omega_0^2 \sin\varphi'$.

Page 339, Sect. 8.7 (Credit: Elizabeth Platt, December 2003)

In the line immediately before Eq. (8.70) the $\dot{\phi}$ should be replaced by $\dot{\varphi}$. The end of that sentence should now be "…an equation for $\dot{\varphi}$ when $\varphi = 0$."

Page 347, Sect. 8.8 (Credit: Tabare Gallardo, October 2001)

Although $\Phi = 0$ (for $k \geq 2$) satisfies Eq. (8.119), substituting $\Phi = 0$ into Eq. (8.118) requires that $\bar{\delta} = 0$ for this equation to be satisfied. Therefore the first sentence at the top of page 347 should read: "For $k \geq 2$ there is always an equilibrium point at $\Phi = 0$ for $\bar{\delta} = 0$."

Page 349–358, Sect. 8.8 (Credit: Helena Morais, July 1999)

There is a subtlety concerning the sign of terms in various expressions in this section. From Table 8.5 it is clear that f_d is positive for first-order resonances and negative for second-order resonances. In fact, f_d is negative for odd order resonances and positive for even order resonances. This was pointed out after Eq. (8.45). The sign is important in determining the location of equilibrium points. After Eq. (8.106) we noted that f_d is taken to incorporate any indirect as well as direct terms. Again we pointed out (after the definition of $\bar{\epsilon}$ in Eq. (8.113)) the relationship between the sign of f_d and the order of the resonance. However, Helena Morais has pointed out that by including the indirect terms it is possible for the sign of f_d to change. Our statement about the incorporation of the indirect terms still stands but in equations such as Eq. (8.132), Eq. (8.134), Eq. (8.146), Eq. (8.156), Eq. (8.158) and Eq. (8.168) it should be understood that the term inside the square bracket should always be positive and the absolute value should always be taken.

Page 345, Eq. (8.108) (Credit: Angela Flynn, November 1999)

On the right-hand side of Eq. (8.108) the coefficient of $\dot{\varpi}'_\mathrm{sec}$ should be k. The corrected equation is:

$$\bar{\alpha}' = [(j-k)n^* - jn'^* + k\dot{\varpi}'_\mathrm{sec}]/k \tag{8.108}$$

Page 350, Eq. (8.137) (Credit: Angela Flynn, October 1999)

The Δ in the denominator should be $\Delta^{\frac{1}{3}}$ (cf. the formula for the first root given in Eq. (8.136)). The corrected equation is:

$$x_{2,3} = \frac{(3^{\frac{1}{3}} \pm 3^{\frac{5}{6}}\,\mathrm{i})\bar{\delta} + (-1 \pm \sqrt{3}\,\mathrm{i})\Delta^{\frac{2}{3}}}{3^{\frac{2}{3}} 2 \Delta^{\frac{1}{3}}} \tag{8.137}$$

Page 350, Sect. 8.7 (Credit: Elizabeth Platt, December 2003)

The inequalities in the penultimate paragraph need to be changed slightly. There is one real root for $\bar{\delta} > -3$ (not $\bar{\delta} \geq -3$) and three real roots for $\bar{\delta} \leq -3$ (not $\bar{\delta} < -3$). The last two sentences of this paragraph should be: "It is clear from its definition that Δ is always real for $\bar{\delta} > -3$ and this always gives one real root, x_1. For $\bar{\delta} \leq -3$ there are always three real roots, even though the quantity Δ becomes complex."

Page 369, Eq. (8.201) (Credit: Angela Flynn, October 1999)

There should be a minus sign in front of the first term on the right-hand side of Eq. (8.201). The corrected equation is:

$$\bar{\delta} = -\frac{1}{2}(x_2^2 + x_1^2) + 4(x_1 + x_2)^{-1} \tag{8.201}$$

Page 378, Figure 8.23

There should be a line from each arrowhead back towards Fig. 8.23c.

Page 383–385, Sect. 8.12.2

There are several problems in this section arising from using the incorrect value of δ for the bifurcation. Inspection of Fig. 8.12 shows that there are actually two bifurcation values, corresponding to $\bar{\delta} = +4$ and $\bar{\delta} = -4$. The one of interest to us is $\bar{\delta} = -4$ (see the critical curve for $\mathcal{H}_2 = 0$ in Fig. 8.12d). This gives $\bar{\delta} = -4(1 + \delta)$. Therefore the second to fourth lines of Sect. 8.12.2 should read: "Again there is a critical separatirx at $\delta = 0$ and it is easy to show that for this value of δ there are five equilibrium points at $\Phi_1 = 4$ (with $x = 0$, $y = \pm\sqrt{8}$) and $\Phi_2 = \Phi_3 = 0$ (three points coincident at the origin)." This correction leads to several more corrections (see below). Most importantly the value of $\Phi_{\rm crit}$ is 4, not 1/2. Therefore, the second paragraph of Sect. 8.12.2 should have the inequality $\Phi_{\rm init} < \Phi_{\rm crit} = 4$. This changes the value of $e_{\rm crit}$, $e'_{\rm crit}$ and the relationship between their initial and final values.

Page 383, Eq. (8.221)

This equation for the critical curve is incorrect for the reasons given above. The corrected equation is:

$$\Phi^2 - 4\Phi(1 - \cos 2\phi) = 0 \tag{8.221}$$

Page 383, Eq. (8.222)

The limits on the integral and the result of the integral are incorrect for the reasons given above. The corrected equation is:

$$J_{\rm crit} = 4\int_0^8 \frac{\Phi\dot{\phi}}{\dot{\Phi}}\, {\rm d}\Phi = 8\pi = 2\pi\Phi_{\rm crit} \tag{8.222}$$

Page 383, Eq. (8.223)

The numerical factor in the denominator should be 32 and not 16 for the reasons given above. This now agrees with the expression in eq. (B7) of Dermott *et al.* (1988). The corrected equation is:

$$e_{\rm crit} = \left[\frac{3}{32 f_{\rm d}}(2 - j)^{\frac{4}{3}} j^{\frac{2}{3}} \frac{m_{\rm c}}{m'}\right]^{-1/2} \tag{8.223}$$

Page 383, Eq. (8.224)

The numerical factor in the denominator should be 32 and not 16 for the reasons given above. This now agrees with the expression in eq. (B9) of Dermott *et al.* (1988). The corrected equation is:

$$e'_{\mathrm{crit}} = \left[\frac{3j^2}{32f_{\mathrm{d}}}\frac{m_{\mathrm{c}}}{m}\right]^{-1/2} \tag{8.223}$$

Page 384, Eq. (8.231)

The right-hand side of this equation is incorrect for the reasons given above. It should be simply the right-hand side of Eq. (8.230) divided by 2π, i.e. $(1/2)(1+2\delta_{\mathrm{t}})$. The corrected equation is:

$$\Phi_{\mathrm{init}} + \Phi_{\mathrm{final}} = \frac{1}{2}\left(1+2\delta_{\mathrm{t}}\right) \tag{8.231}$$

Page 384, Eq. (8.232)

The numerical factor in the denominator should be 32 and not 16 for the reasons given above. The corrected equation is:

$$e^2_{\mathrm{init}} + e^2_{\mathrm{final}} = (1+2\delta_{\mathrm{t}})\left[\frac{3}{32f_{\mathrm{d}}}(2-j)^{\frac{4}{3}}j^{\frac{2}{3}}\frac{m_{\mathrm{c}}}{m'}\right]^{-1} \tag{8.232}$$

Page 385, Eq. (8.233)

The numerical factor in the denominator should be 32 and not 16 for the reasons given above. The corrected equation is:

$$e'^2_{\mathrm{init}} + e'^2_{\mathrm{final}} = (1+2\delta_{\mathrm{t}})\left[\frac{3j^2}{32f_{\mathrm{d}}}\frac{m_{\mathrm{c}}}{m}\right]^{-1} \tag{8.232}$$

Page 401, Eq. (8.299) (Credit: Eric Ford, May 2006)

In this equation the quantity ω is not defined. It is the frequency of circulation and is defined in eq. (39) of the paper by Malhotra *et al.*(1989). To include the definition of ω we need to modify the wording immediately following Eq. (8.229). This should now be: "where ω is the frequency of circulation (see Malhotra *et al.*, 1989) and we have used . . . ".

Page 408, Question 8.5

In order to answer the second part of the question you need to know the initial eccentricity of the particle. This should be taken to be zero. Therefore the last sentence of the question should now read: "Calculate the predicted change in the particle's eccentricity at each resonant encounter assuming that its initial eccentricity is zero."

Page 408, Question 8.6

The variation in semi-major axis is quite complicated because of coupling. Therefore the last part of the question should now read: "Use the data given above to calculate the amplitude and period of the variation in e and ϖ due to the effects of the near 3:2 resonance between the planets."

Page 413, Eq. (9.1) (Credit: Maria Genagritou, March 2005)

The sign in front of the factor μ_2 in the second term on the right-hand side of the equation should be $-$ and not $+$. The corrected equation is:

$$\ddot{x} - 2n\dot{y} - n^2 x = -\mu_1 \frac{x+\mu_2}{r_1^3} - \mu_2 \frac{x-\mu_1}{r_2^3} \tag{9.1}$$

Page 420, Sect. 9.3 (Credit: Harry Varvoglis, October 2001)

It is misleading to state in the legend to Fig. 9.10 and elsewhere on this page that γ is a function of time. As given in Eqs. (9.7) and (9.8) γ is defined in terms of a limit as $t \to \infty$ and therefore does not change with time. What we are plotting in Fig. 9.10 is the (log of the) quantity on the right-hand side of Eq. (9.7) as a function of the (log of the) time. Only in the limit does this quantity tend to γ. What we should have done is define a quantity such as $\chi(t_{\max}) = \lim_{t \to t_{\max}} \ldots$ in Eq. (9.7) and then plot $\log \chi(t_{\max})$ as a function of $\log t_{\max}$. In that case $\gamma = \lim_{t_{\max} \to \infty} \chi(t_{\max})$.

Page 428, Sect. 9.4 (Credit: Harry Varvoglis, October 2001)

Usually a separatrix is a curve. When we mention "chaotic separatrices" on line 6 we are referring to the chaotic strip around the separatrix of the unperturbed case. For clarity the phrase "...chaotic separatrices ..." should be replaced by "...chaotic strips around the separatrix of the unperturbed case ...".

Page 433, Eqs. (9.32–35) (Credit: Tabare Gallardo, December 2001)

In these equations we are using the first term in the resonant part of the Hamiltonian, not the secular part. Consequently the superscript (sec) should be replaced by (res) in Eqs. (9.32)–(9.35). The corrected equations are:

$$\dot{x} = -\frac{\partial \mathcal{H}_1^{(\mathrm{res})}}{\partial y} = -\frac{4\pi C_1}{\Delta} y \cos\varphi = -\frac{R_1}{\Delta} y_1 \tag{9.32}$$

$$\dot{y} = +\frac{\partial \mathcal{H}_1^{(\mathrm{res})}}{\partial x} = -\frac{4\pi C_1}{\Delta} x \cos\varphi = -\frac{R_1}{\Delta} x_1 \tag{9.33}$$

$$\dot{\Phi} = -\frac{\partial \mathcal{H}_1^{(\mathrm{res})}}{\partial \varphi} = -\frac{2\pi C_1}{\Delta} (x^2 - y^2) \sin\varphi \tag{9.34}$$

$$\dot{\varphi} = +\frac{\partial \mathcal{H}_1^{(\mathrm{res})}}{\partial \Phi} = 0 \tag{9.35}$$

Page 435, Eq. (9.60) (Credit: Tabare Gallardo, December 2001)

The equals sign is missing from this equation. The corrected equation is:

$$\varphi^{(4)} = \varphi^{(3)} + \frac{\pi}{2} \left(\frac{\mu_1^2}{\left[\Phi^{(3)}\right]^3} - 3 \right). \tag{9.60}$$

Page 438, Eq. (9.86) (Credit: Dimitri Veras, September 2002)

The denominator in this equation should be ε^2 and not ε_2. This now agrees with eq. (10) of Duncan *et al*. (1989). The corrected equation is:

$$\Delta z = \frac{\mathrm{i}g \exp(\mathrm{i}\lambda_\mathrm{c})}{\varepsilon^2} \mathrm{sign}\,(\varepsilon) \frac{m_2}{m_1} \tag{9.86}$$

Page 439, Eq. (9.92) (Credit: Dimitri Veras, September 2002)

The denominator in this equation should be ε_1^2 and not ε_1. This now agrees with the first line of eq. (16) of Duncan *et al*. (1989). The corrected equation is:

$$z_{n+1} = z_n + \frac{\mathrm{i}g \exp(\mathrm{i}\lambda_n)}{\varepsilon_1} \,\mathrm{sign}(\varepsilon_1^2) \frac{m_2}{m_1} \tag{9.92}$$

Page 439, Eq. (9.95) (Credit: Dimitri Veras, September 2002)

The denominator in this equation should be ε_1^2 and not ε_1. This now agrees with the first line of eq. (17) of Duncan *et al*. (1989). The corrected equation is:

$$z_{n+1} = z_n + \frac{\mathrm{i}g \exp(\mathrm{i}\lambda_n)}{\varepsilon_1^2} \frac{m_2}{m_1} \tag{9.95}$$

Page 441, Eq. (9.102) (Credit: Tabare Gallardo, December 2001)

The subscript for the m is incorrect. The term inside the summation should be m_j and not m_i. The corrected equation is:

$$\eta_i = \sum_{j=0}^{i} m_j. \tag{9.102}$$

Page 449, Eqs. (9.129), (9.131), (9.132) and (9.133) (Credit: Krzysztof Gozdziewski, 2001 and Paul Wiegert, November 2001)

There are several sign changes arising from an incorrect sign in front of the summation in Eq. (9.129). The error propagates into Eqs. (9.131–9.133). Paul Wiegert has also pointed out that the upper limit in the first summation in Eq. (9.132) is missing; it should be $N-1$. The corrected equations are:

$$(\dot{\mathbf{p}}_i)_\mathrm{cartesian} = -\nabla_{\mathbf{r}_i}\mathcal{H}_\mathrm{cartesian} = -\sum_{\substack{k=0\\(k\neq i)}}^{N-1} \frac{\mathcal{G}m_i m_k}{r_{ik}^3}\mathbf{r}_{ik} \tag{9.129}$$

$$\left(\dot{\tilde{\mathbf{p}}}_i\right)_\mathrm{cartesian} = \left(\frac{\eta_{i-1}}{\eta_i}\right) \sum_{\substack{k=0\\(k\neq i)}}^{N-1} \frac{\mathcal{G}m_i m_k}{r_{ik}^3}\mathbf{r}_{ik} + \left(\frac{m_i}{\eta_i}\right) \sum_{j=0}^{i-1} \sum_{\substack{k=0\\(k\neq j)}}^{N-1} \frac{\mathcal{G}m_j m_k}{r_{jk}^3}\mathbf{r}_{jk} \tag{9.131}$$

$$\left(\dot{\tilde{\mathbf{v}}}_i\right)_\mathrm{interaction} = \frac{\mathcal{G}\tilde{M}_i}{\tilde{r}_i^3}\tilde{\mathbf{r}}_i + \sum_{\substack{k=0\\(k\neq i)}}^{N-1} \frac{\mathcal{G}m_k}{r_{ik}^3}\mathbf{r}_{ik} + \frac{1}{\eta_{i-1}} \sum_{j=0}^{i-1} \sum_{\substack{k=0\\(k\neq j)}}^{N-1} \frac{\mathcal{G}m_j m_k}{r_{jk}^3}\mathbf{r}_{jk}. \tag{9.132}$$

$$
\begin{aligned}
\left(\dot{\mathbf{v}}_i\right)_{\text{interaction}} =& \mathcal{G}\tilde{M}_i \left[\frac{\tilde{\mathbf{r}}_i}{\tilde{r}_i^3} - \frac{\mathbf{r}_{0i}}{r_{0i}^3}\right] - \left(\frac{\eta_i}{\eta_{i-1}}\right)\sum_{j=1}^{i-1}\frac{\mathcal{G}m_j}{r_{ji}^3}\mathbf{r}_{ji} \\
&+ \sum_{j=i+1}^{N-1}\frac{\mathcal{G}m_j}{r_{ij}^3}\mathbf{r}_{ij} + \frac{1}{\eta_{i-1}}\sum_{j=0}^{i-1}\sum_{k=i+1}^{N-1}\frac{\mathcal{G}m_j m_k}{r_{jk}^3}\mathbf{r}_{jk}.
\end{aligned}
\tag{9.133}
$$

Page 449, Sect. 9.6 (Credit: Harry Varvoglis, October 2001)

The penultimate sentence on this page should read: "Since we are dealing with a two-dimensional Hamiltonian system the motion is area preserving." For three-dimensional systems the motion is volume preserving.

Page 456, Sect. 9.7

Two new sentences need to be added at the end of Sect. 9.7 to cover the work on the chaotic obliquity of planets. The additional sentences should read: "Even the planets are not immune from chaotic rotation. Laskar & Robutel (1993) showed that the obliquities of all the terrestrial planets could have experienced chaotic variations in the past. In the case of Mars the changes are several tens of degrees (Laskar & Robutel 1993, Touma & Wisdom 1993)."

Page 456, Sect. 9.8 (Credit: Giacomo Giampieri, September 1999)

In line 3 of the first paragraph the total mass of the asteroid belt should be $\sim 10^{-9}$ solar masses and not $\sim 10^{-9}$ Earth masses — our apologies for the slight underestimate!

Page 459, Sect. 9.8 (Credit: Harry Varvoglis, October 2001)

On line 8 replace "the the relative" by "the relative".

Page 462, Eq. (9.154)

There is a missing factor μ in the second line of the equation (cf. eq. (1) of Wisdom 1985a; note too that the additional "(" in Wisdom's equation is an error). The corrected equation is:

$$
\begin{aligned}
\mathcal{H} =& -\frac{\mu_1^2}{2\Phi^2} - 3\Phi + \mu F(x^2+y^2) + e'\mu G x \\
&- \mu\left[C(x^2-y^2) + e'Dx + e'^2E\right]\cos\phi \\
&- \mu(C2xy + e'Dy)\sin\phi\,.
\end{aligned}
\tag{9.154}
$$

Page 462, Eq. (9.155)

The second line of the equation needs to be removed (cf. eq. (2) of Wisdom 1985a). The corrected equation is:

$$
\begin{aligned}
\mathcal{H} =& -\frac{\mu_1^2}{2\Phi^2} - 3\Phi + \mu F(x^2+y^2) + e'\mu G x \\
&- \mu A(x,y)\cos[\phi - P(x,y)]\,.
\end{aligned}
\tag{9.155}
$$

Page 470, Sect. 9.10

The paragraph that starts "An alternative approach ..." should have mentioned the 1992 paper by Sussman and Wisdom (see correction to reference list). The following needs to be inserted at the end of the paragraph: "A comparable timescale of 4 million years was found by Sussman & Wisdom (1992) who carried out a 100 million year full integration of all the planets. They also showed that the orbits of the four giant planets behave chaotically."

Page 472, Question 9.3

Stating that the initial condition is $3\lambda' - \lambda = 180°$ is not sufficient to determine the initial values of λ and λ' uniquely. For the purposes of answering the question you should take initial values of $\lambda' = 0$ and $\lambda = 180°$.

Page 473, Question 9.6 (Credit: Tolis Christou, January 2000)

The phrase "using a mapping interval $\Delta t = 5$ days" should be removed from the end of the third sentence in the question and placed after the words "50 years" in the second sentence. The second and third sentences should now read: "Use the program to integrate the orbits of the planets for 50 years using a mapping interval $\Delta t = 5$ days starting at the epoch of J2000 (JD 2451545.0) using the data given in Table A.2 and the masses given in Table A.4. Use Eq. (A.14) and Table A.3 to calculate the mean longitude of each planet at 100 day intervals for 50 years. Compare these values with those obtained using the map with a mapping interval of (a) 1 day and (b) 10 days, listing the maximum difference over the 50 year interval in each case."

Page 497, Eq. (10.44)

The undefined symbol p_r in Eq. (10.44) should be ρ. This is the density of the particle and is referred to just prior to Eq. (10.41). Note that this particular error jumped publication species, having previously occurred in Eq. (12) of the article by Dermott (1984). The corrected equation is:

$$t_{\mathrm{plasma}} \approx \frac{2d\rho}{3r\rho_{\mathrm{p}}} \frac{n}{(n - \Omega_{\mathrm{p}})} \tag{10.44}$$

Page 498, Sect. 10.5.2 (Credit: Shafi Ahmed, May 2001)

Towards the end of the first paragraph is the equation $2A = a(1+e) - a(1-e) = ae$. There is a factor two missing from the ae term. The correct equation is $2A = a(1+e) - a(1-e) = 2ae$ so that the amplitude is $A = ae$.

Page 499, Eq. (10.52) (Credit: Shafi Ahmed, May 2001)

The term in the denominator of Eq. (10.52) should be Δa_0 and not Δa. The correct equation is:

$$\frac{\delta a}{a} = \frac{2}{3} \frac{a}{\Delta a_0} e^2. \tag{10.52}$$

Page 500, Sect. 10.5.2 (Credit: Shafi Ahmed, May 2001)

On the third line after Eq. (10.53) replace "as an radial impulse" by "as a radial impulse".

Page 500, Eq. (10.56) (Credit: Shafi Ahmed, May 2001)

The equation is only an approximation. The actual coefficient, based on taking $\Delta t \approx 0.2P$ with $P = 2\pi/n$ and using Eq. (10.55) is 1.885 which we have approximated to 2. Equation (10.56) should be

$$\Delta t \approx \frac{2\Delta a_0}{Ua} \tag{10.56}$$

Page 519, Sect. 10.8

The number of equilibrium points associated with the 42:43 corotation inclination resonance is 86 not 84. Hence the maximum extent (as stated correctly in the paper by Porco 1991) is $360/86 = 4.2°$ (rounded to one decimal place) and not 4.3°. This requires two small changes to the second paragraph of Sect. 10.8. In the first the "84 equilibrium points" should now read "86 equilibrium points". In the second "maximum extent of $360/84 = 4.3°$" should now read "maximum extent of $360/86 = 4.2°$".

Page 525, Question 10.5

In order to determine the widths of the resonances you have to know the masses of the satellites and these are not given in Table A.11. For the purposes of answering the question you can assume that the density of each satellite is 1.2 g cm^{-3}.

Page 525, Question 10.6

You need to know the mass of Galatea but this is not given in Table A.13. For the purposes of answering the question you can assume that the density of Galatea is 1.2 g cm^{-3}.

Page 530, Sect. A.4 (Credit: Shafi Ahmed, May 2001)

In the paragraph beginning "As an example ..." the last sentence should start "Using Tables A.2 and A.3 ...".

Page 531, Appendix A, Table A.4

The rotation period of Mercury should be 1407.51 hours and not 1047.51 hours.

Page 531, Appendix A, Table A.5 (Credit: Than Putzig, December 2002)

The quoted inclination of the Moon's orbit is with respect to the *ecliptic*, not the Earth's equator. Therefore a note to this effect needs to be added below the table. The note should read: "Note: The quoted inclination is with respect to the ecliptic." The orbital inclination of the moon with respect to the Earth's equator varies between 18.28° and 28.58°.

Page 549, Appendix B, Table B.11 (Credit: Hiroshi Kinoshita, August 2002)

The term outside the square bracket at the end of the definition of f_{50} should be A_{j-1} and not A_{j-}. The last line of the corrected expression is:

$$+14\alpha^2 D^2 - 17j\alpha^2 D^2 - 2\alpha^3 D^3 - 4j\alpha^3 D^3 - \alpha^4 D^4 \big] A_{j-1}$$

Page 557, References B

The second author on the Bailey *et al.* (1992) reference is "Chambers, J.E." and not "Chamber, J.E.". My apologies to John Chambers.

Page 559, References B

The sixth author on the Burns *et al.* (1999) reference is "Ockert-Bell, M.E." and not "Ocketr-Bell, M.E.". My apologies to Maureen Ockert-Bell.

Page 559, References C

The two papers by Champenois and Vienne have now been published. The references are:

Champenois, S. and Vienne, A. (1999a). Chaos and secondary resonances in the Mimas-Tethys system, *Celest. Mech. Dyn. Astron.*, **74**, 111–146.

Champenois, S. and Vienne, A. (1999b). The role of secondary resonances in the evolution of the Mimas-Tethys system, *Icarus*, **140**, 106–121.

Page 559, References C

The paper by Christou has now been published. The reference should now read:

Christou, A.A. (2000). A numerical survey of transient co-orbitals of the terrestrial planets, *Icarus* **144**, 1–20.

Page 562, References D

The paper by Duxbury and Callahan (1982) is contained in the conference abstracts. The full reference should read:

Duxbury, T.C. and Callahan, J. (1982). Phobos and Deimos cartography, *Lunar Planet. Sci.* **XIII**, 190 (abstract).

Page 566, References L

The following reference needs to be added:

Laskar, J. and Robutel, P. (1993). The chaotic obliquity of the planets, *Nature* **361**, 608–612.

Page 569, References N

The paper by Nakamura et al. is incorrectly referenced. The reference should read:

Nakamura, Y., Latham, G.V., Dorman, H.J. and Duennebier, F.K. (1976). Seismic structure of the Moon: A summary of current status *Proc. Lunar Sci. Conf.* **7**, 3113–3121.

Page 572, References S (Credit: Angela Flynn, October 1999)

The second author on the Shoemaker *et al.* (1989) reference is "Shoemaker, C.S." and not "Shoemaker, E.S.". My apologies to Carolyn Shoemaker.

Page 573, References S

The following reference needs to be added:

Sussman, G.J. and Wisdom, J. (1992). Chaotic evolution of the solar system, *Science* **257**, 56–62.

Page 573, References T

The following reference needs to be added:

Touma, J. and Wisdom, J. (1993). The chaotic obliquity of Mars, *Science* **259**, 1294–1297.

Carl D. Murray