Errata for Gravity: An Introduction to Einstein's General Relativity, *Printings 1-3, B: typos, etc.*

Updated 11/18/2004

The errata that were not corrected in the in the first three printings have been divided into two parts: First, a list (A) of changes that affect the meaning, clarity or correctness of the text. Second, *this* list (B), of typos, mispellings, punctuation errors, repeated words, etc which do not change the meaning of the text. Thanks are due to Florian Colbatzky who supplied most of these and to Eric Corsini, Katherine Holley, and Mario Serna, .

xv, ℓ8: Replace "the the " with "the".

xiv, credit for figure in Box 6.2: Replace with "Courtesy of Robert Nelson".

5, Figure 1.1: In the figure, replace "laboratorymeasurement" with "laboratory measurement" (missing space).

35, Box 3.1, ℓ6: Replace "Observing the the" with "Observing the".

37, Box 3.2, ℓ5 from bottom: Replace "of the another kind" with "of another kind".

43, ℓ3 above (3.36): Replace 'maxima' by 'local maxima', and 'minima' by 'local minima'.

43, last line: Replace "the the" with "the".

54, Figure 4.7: Replace "paths of the light pulse travels" with "path the light pulse travels".

56, 4ℓ before (4.8): Replace "the the line" with "the line".

57, 1ℓ after (4.9): Replace "on the the plane" with "on the plane".

61, Box4.3, ℓ8: Replace "outward an an" with "outward at an".

65, ℓ10 of second paragraph: Replace "occur the same *place*" with "occur at the same *place*".

74, Problem 9: Replace "Consider two twins ...." with "Consider twins..."

92, 3ℓ above (5.71): Replace "of a a photon" with "of a photon".

93, 1ℓ above (5.75): Replace "shows" with "shows that".

95, Box 5.1, 2ℓ after (d) : Replace "with at" with "at".

96, caption for Figure 5.10, last line: Replace "referred to on the" with "referred to the".

108, caption for Fig 6.1, ℓ8: Replace "to the a line" with "to the line".

111, 2nd par, ℓ5: Delete comma before "etc".

111, 2nd par, ℓ7: Replace "or at rest" with "or are at rest".

122, caption for Fig 6.9: Replace "are" with "is".

130, Box 6.2, ℓ9 1st col: Replace "combined both a test both of time" with "combined a test of both time" (ie delete one "both").

136, eq (7.5): Delete period at the end.

148, eq (7.39): Delete period at the end.

152, 2nd par in 7.8, ℓ1: Insert 'they' between 'there' and 'obey'.

161, Figure 7.9, ℓ4: Replace 'and the its position' with 'and the position'.

177, par above (8.30), ℓ2: Replace 'the the' by 'the'.

191, 1st par of 9.3, ℓ3: Replace 'of an the' with 'of an'

198, Fig 9.4, ℓ5: Replace 'infinity' by 'infinity,'. ie add comma.

200, eq(9.44): Comma at end not a period.

201, eq(9.50): Delete period at the end.

206, 2nd par, ℓ2: Replace 'depend' with 'depends'.

207, caption to Figure 9.8: "heavy doted lines" should be "heavy dotted lines".

208, Fig 9.9, ℓ3 from bottom: Replace 'angle to not' with 'angle do not'.

211, eq(9.78): Add comma at end.

216, Prob 15, ℓ2: Replace 'swept out by in' by 'swept out in'. Also in the same line replace 'be be' by 'be'.

219, 3rd par, ℓ3: Replace 'these these' by 'these'.

222, 3rd par, ℓ3: Replace 'showed the predictions' with 'showed that the predictions'.

233, table in Problem 5: In the bottom line of the fourth column 1.00 should be 1.000 .

234, ℓ4 from bottom of text: Replace 'considerd' with 'considered'.

238, 5l from bottom: Replace "is beautiful" with "is a beautiful".

239, 5ℓ from bottom: Replace 'at an angular separation β from the lens and' with 'at an angular separation β from the lens (i.e. at the location of the source) and'

239, 2ℓ from bottom: Replace 'that the a light' with 'that the light'.

240, 2ℓ from bottom of text: Replace 'subtended by star' with 'subtended by the star'.

245, rt.col. 7ℓ from bottom: Change '$\frac{1}{6}$.' into '1/6' (not a case fraction to save space, and no period after 1/6).

248, (11.25): comma after equation.

249, 1st par, ℓ8: Replace 'the the size' with 'the size'.

350, caption for Figure 17.3: Replace 'Fixen' by 'Fixsen'.

256, 2ℓ from bottom: Replace 'the the Newtonian' with 'the Newtonian'.

264, Fig 12.4 3ℓ from bottom: Replace 'The orientations..' with 'The orientation..'.

271, Fig 12.6, 4ℓ from bottom: Replace 'The heavily shaded with' with 'The heavily shaded region with'.

272, Fig 12.7, 5ℓ from top: Replace 'line is given' by 'line given'.

281, first bullet, ℓ4: Replace 'on orbit' with 'on the orbit'.

284, eq(13.3): comma after equation.

287, Fig 13.4, 1ℓ from bottom: Replace 'consistent at' with 'consistent with a'

290, Box 13.1: Periods after eqns (a) and (b).

293, line after (13.15): Replace 'at which black hole' with 'at which the black hole'.

302, eq(14.18): Delete period at the end.

303, 1ℓ from top: Replace 'the the body's' with 'the body's'.

307, eq(14.34): Delete period at end.

307, ℓ3 in Example 14.1: Replace 'the the asymptotic' with 'the asymptotic'.

321, last line: Replace 'burning (see' with 'burning. (See'.

333, 2nd par in 16.2, ℓ2: Replace 'test mass in frame' with 'test mass in a frame'.

340, Fig 16.4, ℓ5: Replace 'of an exactly monochromatic waves' with 'of exactly monochromatic waves'.

342, 3rd par of 16.5, ℓ7: Replace 'of symmetries the flat' with 'of the symmetries of the flat'.

351, Fig 17.4, last line. Replace 'the matter that' with 'as the matter that'

355, 2nd par, ℓ3: Replace 'well.)' with 'well).' .

356, line above (17.11): Replace 'magnitude is' with magnitude m is'.

356, 2ℓ from bottom: Replace 'their periods' with 'the periods of their variation' . (clearer).

357, Fig 17.8: Replace '14, 000' with '14,000'. (no space).

363, footnote 2, ℓ2: Replace 'the the same' with 'the same'.

364, Fig 17.14, ℓ2: Replace '220929' with '220,929' , ie insert comma.

368, ℓ3: Replace '17.2.' with '17.2).' , ie complete parentheses.

370, eq(18.12): Replace comma at end with period.

371, eq(18.15): Replace period at end with comma.

372, subsection title: Replace 'Thermodyanmics' with 'Thermodynamics' (misspelled).

374, 4ℓ after (18.24): Replace 'turn out' with 'turns out'.

375 ℓ4 from top left: Replace 'abundance of the various .... was then' with 'abundances of the various .... were then'.

375, 7ℓ from top left: Replace 'abundance of neutrino species' with 'abundances of neutrino species'.

375, ℓ18 right: Replace 'abundance of neutrinos' with 'abundances of neutrino'.

375, 5ℓ from bottom of text right: Replace 'primoidial abundance' with 'primoidial abundances'.

376, ℓ3 from top: Replace 'oftenwritten' with 'often written'.

376, 2nd par, ℓ4: Replace 'exactly that same' with 'exactly the same'.

378, Fig 18.3, 4ℓ from bottom: Replace 'zero energy' with 'zero-energy'.

379, 3ℓ from bottom of text: Replace 'various type of' with 'various types of'.

380, Example 18.2, ℓ1: Replace 'primoidial abundance of the elements is' with 'primoidial abundances of the elements are'.

381, Box 18.2, 4ℓ above bottom left: Replace 'Problem 28.)' with 'Problem 28).' ie interchange period and paren.

389, 8ℓ after (18.68): Replace 'impossible determine' with 'impossible to determine' .

394, Fig 18.9, 5ℓ from bottom: Replace 'the the potential' with 'the potential'.

394, Fig 18.9, last line: Replace 'is shown' with 'are shown'.

401, 5ℓ from bottom on left: Replace 'primoidial abundance of the elements is' with 'primoidial abundances of the elements are'.

402, ℓ10 from top: Replace 'consistent with with' with 'consistent with'.

405, 5ℓ from bottom: Replace '375.)' with '375).'

407, Fig 19.3: The vertical axis should be labeled by η not t (at the very top of the figure.)

407, Fig. 19.3, 4ℓ from bottom: Replace 'defines of the universe' with 'defines the largest volume of the universe'.

408 eq(19.10): Replace period at end with comma.

408, 4ℓ after (19.11): Replace '.)' with ').'.

408, ℓ4 from bottom: Replace '.)' with ').'.

412, Box 19.2, ℓ2 left: Replace 'a a rapid' with 'a rapid'.

418, last par right, ℓ7: Replace 'abundance' with 'abundances'.

427, section 20.2, par1, ℓ4": Replace 'nonscaler' with 'nonscalar' (mispelling)

431, Fig. 20.2: in the figure **t**ε the ε should not be bold.

446, last line, and 448, 1st line: Replace "nearby particles at one time ... for at later times" with "nearby particles at one time, and its rate of change, (21.5) can be used to calculate the separation for later times" (ie add a phrase (if space)) and change 'at for' to 'for'. of "for at later times"

453, line after equ. (21.25): (misspelling) "Newtonian" inst. of "Newtionian"

453, line before equ. (21.26): "as" inst. of "as:" (for consistency with the other text)

453, last line: "the Γ's will be" inst. of "the Γs will be" ie apostrophe between Γ and the s

458, equ. (21.36b): Replace period at end with comma

459, footnote: Add period at the end of the sentence.

463, equ. (21.58): Replace period with comma

464, equ. (21.60): Add comma at end

464, line before equ. (21.63): "superposing waves like" inst. of "superposing the waves like"?

464, 2 lines before equ. (21.65): "has already been assumed" inst. of "has been already been assumed"

473, ex. 22.1, line 2: "idea of the density" inst. of "idea of a the density"

479, 2 lines before equ. (22.36) "energy density ρ" inst. of "energy density, ρ" ie delete comma as in rest of sentence.

486, last par., line 3: "the" repeated

499, 2 lines after equ. (23.33): "we assume that the stress-energy tensor" inst. of "we assume stress-energy tensor"

506, 8 lines before equ. (23.50): Delete comma after "in (23.35)"

509, Fig. 23.3, line before last line: "The effects ... have" inst. of "The effect ... have"

519, 3 lines before equ. (24.7a): "the" repeated

519, 2 lines before equ. (24.7a): "relativistic" repeated

520, last par., 1st line: "We assume that the matter" inst. of "We assume the matter"?

530, footnote 5, line 1: (misspelling) "work through" inst. of "work though"

532, Fig. 24.11, line 1: "the" repeated

533, 3rd par., line 1: "extremum" instead of "extrema".

536, 2 lines after equ. (24.29): (misspelling) "through Problem 19" inst. of "though Problem 19"

536, Fig. 24.12, line 2: 'and' repeated.