BOOK ERRATA –

Foundational and Applied Statistics for Biologists using R

1st printing, 1st edition

updated 11/10/2014

This document contains a list of book errors to the 1st printing of the 1st edition.

Front material

1. In the cover description "Oreomnos americanus" should be italicized. That is, it should read: *Oreomnos americanus*

2. The following superscript correction should be made:
225 kg^{2}.

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Chapter 1

1. Page 4. ..other equally valid or more valid answers…

2. Page 7. Table 1.1.
…to view evidence for or against hypothesis as a continuum.

3. Page 8. Hans Reichenbach (1891-1953).

4. Page 15. As a result, the field of quantum mechanics…

Chapter 2

1. Page 24. ~~$B \not\subset S$~~

2. Page 34. …where children were taken away…

3. Page 34. 0.16/0.84 = 0.19

4. Page 44. Q. 8a. Draw a Venn diagram representing $P(A) = 0.52$, $P(B) = 0.52$, $P(A \cap B) = 0.2504$.

5. Page 44. Q. 8d. Let $P(A) = 0.52$; $P(B) = 0.52$, and let $P(A \cap B) \neq 0$. Can $P(A \cap B)$ conceivably equal a probability other than 0.2504?

Chapter 3

1. Page 50. To allow correspondence with Figure 3.1 we should have:
"…in which the outcome 1 occurs 32 times, the outcome 2 occurs 5 times, and the outcome 3 occurs 23 times…"

2. Page 51. Typesetting removed equals signs from code.

```
hist(c(rep(1, 2), rep(2, 5), rep(3, 3)), breaks = c(0, 1, 2, 3))
axis(4, at = 0:5, labels = seq(0, 0.5, 0.1))
mtext("Density", 4, line = 2.7, cex = 1.2)
```

3. Page 52. …under the density curve~~, that is,~~ (the definite integral from $-\infty$ to ∞)~~,~~ must equal 1.

4. Page 53. The world "are" is incorrectly italicized. Fragment should read:

   …of cdfs are *survivorship functions* and…

   Formatted: Font: Not Italic

5. Page 54. $F(2) = P(X \leq 2) = 0.1 + $ ~~0.5~~ 0.3 + ~~0.3~~0.5 = 0.9.

6. Page 54. Typesetting caused the <, =, and + symbols in R-code to be removed. The code should read:

```
##pdf
x <- c(0, 1, 2, 3, 4)
f.x <- c(0.5, 0.3, 0.1, 0.05, 0.05)
plot(x, f.x, xlab = "x", ylab = "f(x)", pch  16)
segments(x, 0, x, f.x)

##cdf
~~X~~x <- c(0, 1, 2, 3, 4)
F.x <- c(0.5, 0.8, 0.9, 0.95, 1.0)
plot(x, F.x, xlab = "x", ylab = "F(x)", pch = 16)
segments(x, F.x, x + 1, F.x)
points(1:4, F.x[1:4])
```

7. Page 56. …$\binom{2}{1} = 2$~~,~~ , which gives…

8. Page 58. $= 1.26 \cdot 10^{14} \times 6.50 \cdot 10^{-5} \times 4.25 \cdot 10^{-13} =$ ~~0.0034~~ 0.0035.

9. Page 61. Example 3.4. The total area under the pdf curve in Fig. 3.7 equals one because it is a rectangle whose ~~opposite~~ alternate sides have length 2 and 0.5, and 2 × 0.5 = 1.

10. Page 63. Any outcome, x_i~~,~~, from any normal distribution…

11. Page 63. The current version of Eq. 3.11reads:

$$z_i = \frac{x_i - \mu}{\sigma}$$

    For simplicity, replace it with:

$$z = \frac{x - \mu}{\sigma}$$

12. Page 64

```
integrand <- function(x){1/sqrt(2 * pi~~r~~) * exp(-1/2 * x^2)}
```

13. Page 65 …= 0.9004372.

14. Page 68. Because each of the columns in `larrea` represents…

15. Page 68. …(Fig 3.12) to test the

16. Page 74. Replace: "… when $k \rightarrow \infty$." With: "… when $k = \infty$."

17. Page 74. …can be used to mimic normal distributions…

18. Page 77. In Example 3.10 replace ">" with "≥" and replace "<" with "≤". And make other small changes shown below:

    If $X \sim t(5)$, what is $P(-2 \geq X \geq 2)$? See Fig 3.18.

    We can calculate this *two-tailed probability* by finding $P(X \leq -2) + 1 - P(X \leq 2)$, by finding $P(X \leq -2) + 1 - P(X \geq 2)$, or (since the distribution is symmetric), by obtaining $2P(X \leq -2)$ or $2P(X \geq |-2|)$.

19. Page 78. …combinations of degrees of freedom combination…

20. Page 78. Replace:
    …by obtaining $P(X < 3) - P(X < 1)$.
    With:
    …by obtaining $P(X \leq 3) - P(X \leq 1)$.

21. Page 87 ...that Equation 3.32 3.29 is an adaptation of Equation 3.33 3.30 given below:

22. Page 87 …the Barro Colorado Island analysis is shown in here (Figure 3.26).

23. Page 89. …*logistic generalized linear models*, that is, GLMs (*GLMs*; Chapter 9).

24. Page 90. "…how like likely are is the data a particular null distribution given the data a particular null distribution?"

25. Page 90. …will be equivalent to $P(X > x)$).

26. Page 90. The dataset `catsM` from library…

27. Page 90. The second column in `catsM` contains body…

28. Page 93. Table 3.4. In the Poisson section of the table.
    Replace: MGF = $e^{\lambda(et-1)}$
    With: MGF = $e^{\lambda(e^t-1)}$

29. Page 95. Table 3.5 footnote.

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The area under the pdf curve~~)~~ provides probability.

30. Page 98. Question 13f.

    …(negative binomial ~~of~~ or Poisson)…

31. Page 99. Question 21.

    …demonstrate, using *asbio* GUI functions, that…

Chapter 4

1. Page 108. Interval estimators, described in Ch. ~~6~~5, estimate the bounds of an interval that is expected, preceding sampling, to contain a parameter for a specified proportion of estimates.

2. Page 110. …large degree of variability among ~~growth rates~~ observations.

3. Page 111. …where *d* is ~~the~~ distance and *t* is ~~the~~ time.

4. Page 114. The paragraph starting: "The mean and the median can be…" and ending: "…in the direction of the outliers." is mistakenly formatted to be a part of Example 4.8.

5. Page 115.
   ```
   x <- c(0.001, 0.002, 1, 2, 2.2, 4, 5, 6, 15, 17)
   ```

6. Page 118.
   Replace the R output:
   ```
   [1] 986.075 1222.038 1213.260 1213.260 1213.260 1213.260 1213.260
   1213.260
   [9] 1213.260 1213.260 1213.260
   ```
   With:
   ```
   [1] 986.075 1222.038 1213.260 1213.260 1213.260 1213.260 1213.260
   [8] 1213.260 1213.260 1213.260 1213.260
   ```

7. Page 119. As with ~~the~~ measures of location, there are…

8. Page 123. …obtains the value that a ~~continuous~~ random variable will…

9. Page 123. Analysts often consider observations greater than 1.5 × ~~(~~*IQR*~~)~~ from the median to be outliers.

10. Page 126. For clarity, the description to Eq. 4.29, and the equation itself should concern the *j*th (not the *i*th) moment. That is, these items should read:

    The *jth central sample moment* is given by:

$$m_j = \frac{1}{n}\sum_{i=1}^{n}(X_i - \bar{X})^j$$

11. Page 127. …are ~~the~~ *MOM* (described in Section 4.3.9.2), *ordinary least squares (OLS)* and *maximum likelihood (ML)*.

12. Page 133. In typesetting the "equals" signs and "less than" signs in the code at the top of the page have been deleted. The code should read:

```
trag.sub <- sample(trag, 10, replace = F); p <- seq(35, 80, .1)
anm.loglik(trag, parameter = "mu", dist = "norm", poss = p,
ylim = c(-300, -60), xlim = c(0, 100))
anm.loglik(trag.sub, parameter = "mu", dist = "norm", poss = p,
ylim = c(-300, -60), xlim = c(0, 100))
```

13. Page 135. Furthermore, multiplication ~~of~~ by a constant results in a new mean…

14. Page 137. Table 4.2. Median row.
Replace "$\tilde{x}$" with "*Median*(x)"

15. Page 140. We know that the beta prior is conjugate to the binomial likelihood function, and will result in a beta posterior distribution (Ex. ~~4.17~~ 4.18).

16. Page 143. Question 1.
Distinguish the words *parameter*, *estimator*, and *estimate*.

17. Page 144. Question 9.
For the sample, x ={2, 3, 1, 5, 4, 5.5, 90, 0.001, 95, 4, 5, 10} calculate the arithmetic mean, mode, trimmed mean (α_K = 0.2), and Winsorized mean (λ_K = 0.2).

18. Page 145. Question 21b.
Let $X \sim \text{BIN}(\pi_P, n_X)$, $Y \sim \text{BIN}(\pi_P, n_Y)$.

Chapter 5

1. Page 149. This chapter concerns interval estimation, and resampling, and simulation methods that allow interval estimation.

2. Page 161. …depending on whether or not the variance of the parent population is known ~~or unknown~~.

3. Page 162. We have $1 - (\alpha/2) = 1 - $ ~~0.975~~0.025 = ~~0.025~~ 0.975

4. Page 162. …will be above the ~~z~~ $z_{1-(\alpha/2)}$ quantile…

5. Page 164. In typesetting the equals signs in the code at the top of the page have been deleted. The code should read:

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```
shade.norm(from = 12.64, to = 16.56, mu = 14.6, tail = "middle")
```

6. Page 166. …in the *asbio* dataframe `agrostis`.

7. Page 167. In Example 5.8 shift the R output from `ci.mu.z` so that column names line up with column information. That is, replace:

```
ci.mu.z(agrostis, conf = .95,sigma = 4)
95% z Confidence interval for population mean
Estimate     2.5%    97.5%
14.60    13.03    16.17
```

with:

```
ci.mu.z(agrostis, conf = .95,sigma = 4)
95% z Confidence interval for population mean
Estimate     2.5%    97.5%
   14.60    13.03    16.17
```

8. Page 167. In Example 5.8 shift the R output from `ci.mu.t` so that column names line up with column information. That is, replace:

```
ci.mu.t(agrostis, conf = .95)
95% t Confidence interval for population mean
Estimate      2.5%     97.5%
14.60      9.54     19.66
```

with:

```
ci.mu.t(agrostis, conf = .95)
95% t Confidence interval for population mean
Estimate      2.5%     97.5%
   14.60      9.54     19.66
```

9. Page 167. …engineers (organisms ~~which~~ that causes physical, chemical, or structural…

10. Page 167. …Rendezvous Peak in Grand Teton National Park…

11. Page 167-168. For consistency with the rest of the book *S* and $\bar{X}$ should be capitalized in Eqs. 5.16 and 5.17.

12. Page 168. In typesetting the equals signs in the code at the top of the page have been deleted. The code should read:

```
bplot(y = pika[,2], x = rep(1, 21), int = "CI", conf = .95,
names.arg = "", xlab = "", ylab = "On haypile %N - Off haypile
%N", names = "")
```

13. Page 171…64% ~~smaller than~~ as large as…

14. Page 171. …~~medians~~ means is approximately 64% ~~more~~ as variable ~~than~~ as the distribution of ~~means~~ medians.

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15. Page 170. `1-(2*(pbinom(qbinom(.025,25,.5)-1, 25, 0.5))`

16. Page 173. …to be resampled ~~then~~ than others.

17. Page 173. In Eq 5.29 Replace bias_{θ} with bias_{θ_B} to allow correspondence between Eqs. 5.28 and 5.29.

18. Page 174. Each of the ~~the~~ outcomes…

19. Page 176. This, of course, requires the estimation of $\hat{\sigma}^*_{B_j}$ for each ordered $\hat{\theta}^*_j$.

20. Page 179. …user specification of bootstrap variances (see Section 5.4.1.2.3)

21. Page. 180. … will cause ~~$\hat{\sigma}_{\theta_j}$~~ $\sigma_{\hat{\theta}_j}$ to be underestimated.

22. …expected probabilities for $P(X_{10} \mid X_0 = 1)$ = {0.185, 0.352, 0.315, 0.148}.

23. Page 189. …a common jumping distribution is ~~where~~ $N(\theta^{t-1}, \sigma_1^2)$, where σ_1^2 …

24. Page 194. Question 7.
…that $Z \sim$ ~~$N(1, 0)$~~$N(0, 1)$

25. Page 194. Question 8.
…that $Z \sim$ ~~$N(1, 0)$~~$N(0, 1)$

26. Page 195. Question 10
In part d replace the text "Question 10" with "Question 9".

27. Page 195. Question 14
Redo Example ~~5.9~~ 5.11 by hand…

Chapter 6

1. Page 199. This somewhat complex definition can be expressed as ~~$P(H_0|data)$~~ $P(data|H_0)$ if we remember…

2. Page 206. Observations are independent. That is, they are based on random samples from the population.

3. Page 210. Shift the R output from `ci.mu.t` so that column names line up with column information. That is, replace:

```
ci.mu.t(n = 85, xbar = 128, s = 12, summarized = TRUE)
95% t Confidence interval for population mean
Estimate 2.5% 97.5%
128.0000 125.4117 130.5883
```

Field Code Changed

Field Code Changed

with

```
ci.mu.t(n = 85, xbar = 128, s = 12, summarized = TRUE)
95% t Confidence interval for population mean
Estimate     2.5%    97.5%
128.0000 125.4117 130.5883
```

4. Page 216. An error occurs in the worked example for *MSE*, leading to a small error in the test statistic.

   The example currently reads:

$$\sqrt{MSE} = \sqrt{\frac{12(0.00034) + 24(0.00027)}{34}} = 0.01757838$$
$$t^* = \frac{(0.114 - 0.099) - 0}{0.0176\sqrt{3/24}} = 2.4607$$

   The example should read:

$$\sqrt{MSE} = \sqrt{\frac{11(0.00034) + 23(0.00027)}{34}} = 0.01706$$
$$t^* = \frac{(0.114 - 0.099) - 0}{0.0171\sqrt{3/24}} = 2.4607$$

5. Page 216. …estimated effect size = ~~7×10^{-5}~~ $\bar{x}_{BH} - \bar{x}_{ER} = 0.015$,…

6. Page 219. …will consider the magnet group to be…

7. Page 221. …effect size being used, ~~and~~ the type of statistical analysis one…

8. Page 221. We are interested in the lower-tailed alternative hypothesis that smoking…

9. Page 222. …and power ~~error~~ can be…

10. Page 225. …can be specified as ~~$\mathcal{L}(\text{data} \mid \theta)$~~ $\mathcal{L}(\theta \mid \text{data})$

11. Page 233. …test (the kind we are interested in), the test statistic, *V**, will…

12. Page 234. In an upper tailed test the test statistic *W** will be ~~W_1~~ W_2. In a lower tailed test the test statistic *W** will be ~~W_2~~ W_1.

13. Page 234. and the upper tailed *P*-value will be ~~$P(W \geq W^*)$~~ $P(W \leq W^*)$

14. Page 236. Make the following changes:
    Because this is an upper tailed test we use ~~W_1~~-W_2 as the test statistic.
    We can get the lower-tailed *P*-value directly by finding ~~$P(W \geq 66)$~~ $P(W \leq 34)$, where $W \sim$ *WRankSum*(10, 10). The function pwilcox provides the Wilcoxon rank sum distribution cdf.

Field Code Changed

Field Code Changed

```
pwilcox(6634, 10, 10, lower.tail = FALSETRUE)
[1] 0.1087813 0.1237253
```

15. Page 236
    Replace:

$$z^* = \frac{W^* - \mu_W}{\sigma_W} = \frac{66 - 50}{13.20885} = 1.2113$$

    With

$$z^* = \frac{W^* - \mu_W}{\sigma_W} = \frac{34 - 50}{13.20885} = -1.2113$$

16. Page 236
```
pnorm(-1.2113, lower.tail = FALSETRUE)
[1] 0.1128902
```

17. Page 237. Coombs et al. (1996) found that Welch's approximate *t*-test was inadequate for comparing means of heteroscedastic populations if underlying populations were not normal, and recommended a test utilizing *M*-estimators for skewed heteroscedastic distributions.

18. Page 237. Example 6.18. The R code in the example contains formatted quotes. The code:
```
ci.boot.M(mglobulin[drug==”Control”],mglobulin[drug==”Trt”])
```

    Should read:
```
ci.boot.M(mglobulin[drug=="Control"],mglobulin[drug=="Trt"])
```

19. Page 241. Question 1
    a. Null hypothesis
    b. Alternative hypothesis
    c. Test statistic
    d. *P*-value
    ~~d~~e. Significance level
    ~~e~~f. Critical value
    ~~f~~g. Decision rule
    ~~g~~h. Type I error
    ~~h~~i. Type II error
    ~~i~~j. Power

20. Page 241, Question 4b should read:
    b. Conduct a null hypothesis test following the steps described for the hybrid method and verify your result using the function `one.sample.z`. State your conclusions correctly.

21. Page 242, Question 5b should read:
    b. Use **R** to calculate ~~population~~ sample means and variances.

22. Page 242, Question 6b should read:
    Use **R** to calculate ~~population~~ sample means and sample variances.

23. Page 243, Question 11a:

…~~click~~ turn off the ~~on~~ *Variance equal* widget.

24. Page 243, Question 14b
…A is ~~greater than~~shifted above B…

25. Page 244, Question 23
…with three samples ~~with~~ from X_1 and…

Chapter 7

1. Page 250. … will always be *natural integer*s…

2. Page 253. …prescription ~~of~~ antidepressants…

3. Page 255. …that ~~are~~ is poorly representative.

4. Page 256. …instead, he or she randomly selects experimental units…

5. Page 259. Figure 7.4 caption.
Two distributions for growth…

   Page 261. Curly brackets around confidence interval bounds should be replaced with parentheses to indicate that the interval includes the bounds. That is,
   Replace: "{43050, 65943}"
   With: "(43050, 65943)"

6. Page 266. …more likely to be chosen as experimental units than others, and will generally…

7. Page 267. Footnote. …data will still have the same "problems" ~~it~~ they had in the first place…

8. Page 275…we would expect a tree to grow, on average, 2.1 m for each 1% increase of N in soils.

9. Page 275. Last sentence in 7.6.4.1. "…nonrandom assignment of treatments given ~~the~~ categorical explanatory variables."

10. Page 277. Last item in the 1st bulleted list.
    - Other ~~P~~particular variants on a predictors, for example, "high", "medium", and "low"

11. Page 278. In a *completely randomized design* (*CRD*) experimental units are randomly assigned to factor levels ~~design~~ without constraints like blocking (Fig. 7.9a).

12. Page 279. Citation to Figure 7.9. Last sentence. Here, EUs are randomly assigned to either ~~A~~ A_1 or ~~B~~ A_2, and then are assigned to the treatment they did not initially receive.

13. Page 282. …most important, in a randomized block design~~,~~ we assume…

14. Page 285. …on human subjects, variability in…

15. Page 286. …distance released from home burrow X = {~~10 m~~ near, ~~100 m~~ far}…

16. Page 288. …test hypotheses of independence ~~and~~ or causality…

17. Page 291. Question 16.
…two teaching approaches ~~with respect to~~ using test scores.

Chapter 8

1. Page 299. ~~*standard*~~ *bivariate standard normal*

2. Page 299. The "sigma" symbols in Eq. 8.4 should be bolded. That is, replace the two occurrences in the equation of σ with **σ**.

3. Page 300. Equal signs in code for Fig 8.3 have been deleted. Function should read:
```
bvn.plot(mu = c(0, 0), vr = c(1, 1), cv = 0, res = 0.1)
```

4. Page 306. Figure 8.6 caption. …if ρ is close to 0~~ or 1~~.

5. Page 305. Equal signs in code for Fig 8.7 have been deleted. Function should read:
```
plot(crab.weight, xlab = "Gill weight (mg)", ylab = "Body weight
(g)")
```

6. Page 310. Equal signs in code for Fig 8.8 have been deleted. Function should read:
```
plot(bats, xlab = "Age (days)", ylab = "Forearm length (mm)")
```

7. Page 312. …possible combinations of (Y_{1i}, Y_{1j}) and (Y_{2i}, Y_{2j}) where…

8. Page 314. The coefficient indicates a strong positive...

9. Page 316. The sample biweight ~~midvariance~~ midcorrelation (along with...

10. Page 316. The sample bivariate ~~midvariance~~ midcorrelation has a high breakdown...

11. Page 318. ...for the true correlation will ~~also be suspected~~ be suspect.

12. Page 319. Question 3a.
…calculate the two-tailed ~~*p*~~*P*-values "by hand"…

Chapter 9

1. Page 328. Typesetting removed equal signs in the code for Fig. 9.3. It should read:
```
plot(vol, freq, xlab = expression(paste("Estimated gular pouch
size ( ",cm^3,")")),ylab = "Fundamental frequency (Hz)")
abline(beta.hat0, beta.hat1)
```

2. Page 330. We have very little ~~no~~ evidence..,

3. Page 331. …squared deviations between each ~~predicted~~ fitted *Y* value and…

4. Page 333. Example 9.5. The pressure reading in example should be -1.5 MPa, not 1.5 MPa. Thus, the fragment of concern should read:
…the permanent wilt point of plants (ψ_{soil} = -1.5 MPa) and the length of the…

5. Page 333. …In regression, **Y** is a ~~(~~$n \times 1$~~;~~ (i.e., *n* row and…

6. Page 335. Eq. 9.27 currently reads:
$$MSR = \hat{\boldsymbol{\beta}}'\mathbf{X}'\mathbf{Y} - \left(\frac{1}{n}\right)\mathbf{Y}'\mathbf{Y} / (p-1)$$
It should be corrected to read:
$$MSR = \hat{\boldsymbol{\beta}}'\mathbf{X}'\mathbf{Y} - \left(\frac{1}{n}\right)\mathbf{Y}'\mathbf{1}\mathbf{Y} / (p-1)$$

7. Page 335. Eq. 9.28 currently reads:
$$MSE = \mathbf{Y}'\mathbf{Y} - \beta'\mathbf{X}'\mathbf{Y} / (n-p)$$
It should be corrected to read:
$$MSE = \mathbf{Y}'\mathbf{Y} - \hat{\boldsymbol{\beta}}'\mathbf{X}'\mathbf{Y} / (n-p)$$

8. Page 335, Eq. 9.29 currently reads:
$$\hat{\boldsymbol{\sigma}}^2_{\hat{b}} = MSE(\mathbf{X}'\mathbf{X})^{-1}$$
It should be corrected to read:
$$\hat{\boldsymbol{\sigma}}^2_{\hat{\beta}} = MSE(\mathbf{X}'\mathbf{X})^{-1}$$

9. Page 342. First two lines at the top of page. The number the "577.1022" is currently spread across two lines. Can it be placed on a single line?

10. Page 342. Middle of third paragraph. The number the "577.1022" is currently spread across two lines. Can it be placed on a single line?

11. Page 344. The second approach provides an interval estimate for a future value of *Y* given ~~a~~ particular ~~value,~~ X_hs.

12. Page 346. Typesetting removed equal signs in the code for Fig. 9.6.
```
with(Fbird, plotCI.reg(vol, freq, xlab = expression(paste("Gular
pouch size ( ",cm^3,")")),ylab = "Fundamental frequency (Hz)"))
```

13. Page 350 "...and corrective procedures that will be required."

14. Page 351. Typesetting removed equals signs in the code for Fig. 9.8. Code should read:
```
par(mfrow = c(2, 2), mar = c(4, 4, 2, 1.5))
plot(Fbird.lm)
```

15. Page 352 “As ~~in~~ indicated....”

16. Page 357. Typesetting removed equal signs and plusses in the code for Fig. 9.9.

```
lm1245 <-lm(Y ~ X1 + X2 + X4 + X5, data = wash.rich)
par(mfrow = c(2, 2), mar = c(4, 4.5, 2, 1))
partial.resid.plot(lm1245)
```

17. Page 362. ~~Without back-transformation, t~~The slope estimate for this…

18. Page 364. Eq. 9.57 currently reads:

$$w_i = \frac{1}{s_i^2}$$

It should be changed to read:

$$w_i = \frac{1}{S_i^2}$$

19. Page 364. Eq. 9.58 currently reads:

$$Q = \sum_{i=1}^{n} w_i (y_i - (\hat{\beta}_0 + \hat{\beta}_1 x_{1i} + \hat{\beta}_2 x_{2i} + ... + \hat{\beta}_{p-1} x_{p-1i}))^2 = \sum_{i=1}^{n} w_i (y_i - \hat{y}_i)^2$$

It should be changed to read:

$$Q = \sum_{i=1}^{n} w_i (y_i - (\hat{\beta}_0 + \hat{\beta}_1 X_{1i} + \hat{\beta}_2 X_{2i} + ... + \hat{\beta}_{p-1} X_{p-1i}))^2 = \sum_{i=1}^{n} w_i (Y_i - \hat{Y}_i)^2$$

20. Page 366. Eq. 9.62 currently reads:

$$x_i = X_i - \bar{X}$$

It should be corrected to read:

$$X_i' = X_i - \bar{X}$$

21. Page 368. A test ~~testing~~ for the equality of regression slopes…

22. Page 369. Example 9.21. The function `Anova` from library *car* (not `anova`) is required here. Thus, the code in the example should read:

```
library(car)
Anova(lm(log(ant.mass) ~ log(head.width) + direction +
log(head.width)
:direction, data = ant.dew))# type II SS
```

23. Page 379. *M* estimator functions down-weight but ~~does~~ do not completely eliminate outliers.

24. Page 380. Here ~~are the coefficients from~~ is the OLS regression model.

25. Page 387. ~~G~~gaussian(link = "identity")

26. Page 392. The *sensitivity* (i.e., true positive rate) is the number of true positives ~~multiplied~~ divided by the number of observed positives and false negatives: 14/15 = 0.93. The *specificity*

(i.e., *true negative rate*) is the number of true negatives divided by the number of observed negatives and false positives: 6/9 = 0.67 (also see Example 2.11).

27. Page 397. …as a function of the linear predicted values, and re-emphasi~~i~~zes the presence of the three outliers.

28. Page 398. Typesetting removed equal signs in the code for Fig. 9.23.

```
par(mfrow = c(2, 2), mar = c(4, 4, 2, 1.5))
plot(beetle.glm)
```

29. Page 399. …(it is the mean times one minus the ~~mean~~ probability of success).

30. Page 400. Parameter~~s~~ estimates are obtained…

31. Page 400. …certain *X*~~,~~ threshold,…

32. Page 406. Typesetter error. The conventional equation describing predicted values from the linear model should be bolded to indicate matrices. That is, the sentence at the send of the 2nd paragraph on this page should read:

    Given outcomes from Equations 9.109 and 9.110, fitted values can be obtained using $\hat{\mathbf{Y}} = \mathbf{X}\hat{\boldsymbol{\beta}}$.

33. Page 409. …will not be obtained as the result of spline, and mixed ~~parametric~~ non-spline/spline fitting.

34. Page 409. …eliminates the need for subjective assignment…

35. Page 410. …assess the legitimacy of binomial and Poisson errors, which have dispersion…

36. Page 412. Figure 9.26. A couple of typesetter errors here. First, the code for the figure is given twice on this page. The 2nd iteration (just above the figure) is actually incorrect and should be removed as it leaves out equal signs in the arguments. Second, important commas have been left off the *X* and *Y* axes in the figure. They should read: $\beta_0 \mid Y, \sigma^2$ and $\beta_1 \mid Y, \sigma^2$, respectively.

37. Page 416, Question 9d currently reads:

    Calculate $SSR = \hat{\boldsymbol{\beta}}\mathbf{X}'\mathbf{Y} - \left(\frac{1}{n}\right)\mathbf{Y}'\mathbf{1}\mathbf{Y}$.

    The $\hat{\boldsymbol{\beta}}$ term needs to be transposed (given a " ' "), and MSR should be calculated instead SSR. Thus, the question should be changed to read:

    Calculate $MSR = \hat{\boldsymbol{\beta}}'\mathbf{X}'\mathbf{Y} - \left(\frac{1}{n}\right)\mathbf{Y}'\mathbf{1}\mathbf{Y} / (p-1)$.

38. Page 416, Question 9e currently reads:

    Calculate $SSE = \mathbf{Y}'\mathbf{Y} - \boldsymbol{\beta}'\mathbf{X}'\mathbf{Y}$.

    The $\boldsymbol{\beta}$ term needs to be given a hat, and MSE should be calculated instead SSE. Thus, the question should be changed to read:

Calculate $MSE = \mathbf{Y}'\mathbf{Y} - \hat{\boldsymbol{\beta}}'\mathbf{X}'\mathbf{Y} / (n - p)$.

39. Page 416, Question 9g currently reads:

    Calculate $\mathbf{e} = \mathbf{Y} - \hat{\mathbf{Y}}$

    It should be changed to read:

    Calculate $\hat{\boldsymbol{\varepsilon}} = \mathbf{Y} - \hat{\mathbf{Y}}$

Chapter 10

1. Page 422. Factors ~~levels~~ will be indicated….
2. Page 434. …first two alphanumeric factor~~s~~ levels.
3. Page 435. …because the last factor level…
4. Page 436. ~~Four~~ Five important methods are briefly described here.
5. Page 437. Scheffé's method has the property that if H_0: $\mu_1 = \mu_2 = \ldots = \mu_{a,}$ is rejected at α, then at least one comparison out of all possible comparisons (considered by this method) will also reject H_0 at α (Milliken and Johnson 2009). This is…
6. Page 438. …is the *F*-quantile function with $a - 1$ numerator degrees of freedom~~,~~ and $n - a$ denominator degrees of freedom, evaluated at the probability $1 - \alpha$.
7. Page 441. Section 10.3.6. Holm's procedure is more powerful than a strict Bonferroni correction because ~~smaller~~ larger significance levels are used for all but the first comparison.
8. Page 442. Section 10.3.7. The following correction should be made:
   We note that the interval for the single significant comparison, AE versus C, does not contain zero.
9. Page 450. …there must be ~~a~~ replication ~~available~~ for the nested factor.
10. Page 450. The argument `weights` allows modeling of heteroscedasticity of the…
11. Page 453. The sign for 369.5417 in the calculation for G^2 needs to be changed as shown below:
    $G^2 = 2(-369.5417 + 378.3228) = 17.562$.
12. Page 453. ~~That is~~ Specifically, we conclude that ~~at least some of the~~ laboratories vary in their…
13. Page 455. In typesetting the equals signs in the code at the top of the page have been deleted.

```
baby.lm <- lm(date ~ treatment, data = baby.walk)
par(mfrow = c(2, 2), mar = c(4, 4, 2, 1.5))
```

```
plot(baby.lm)
```

14. Page 457. 1st paragraph. The equation for d_{ij} should read: $d_{ij} = | \hat{\varepsilon}_{ij} - \tilde{\varepsilon}_i |$

15. Page 458. In typesetting the equals signs in the code at the top of the page have been deleted. The code should read:

```
plot(ref.K, cex = 1.2, grid = F, id = .05, adj = -0.5)
qqnorm(ref.K, cex = 1.2,main = "", id = .05, adj = -0.5)
plot(ref.K, resid(., type = "p") ~ fitted(.) | lab, abline = 0)
qqnorm(ref.K, ~ ranef(.), cex = 1.2, grid = F, id = .05, adj = -
0.5)
```

16. Page 459. …contour cutoff for outliers at `1 - id/2` (see code ~~below~~ for Fig. 10.7).

17. Page 459. …factorial design, factors are fully crossed~~;~~. ~~t~~That is, every experimental…

18. Page 459. … an equal number of experimental units assigned to each factor-level combination…

19. Page 469. The random block ~~randomized design~~ model can be expressed in the form of…

20. Page 470. …that `loc`, `block%in%loc` and `cross:loc` are random effects.

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21. Page 471. Table 10.9. In the SS column. The SS for *B*(*A*) currently reads:

$$n_0 \sum_{j=1}^{b} (\bar{Y}_j - \bar{Y})^2$$

It should be corrected to read:

$$n_0 \sum_{i=1}^{a} \sum_{j=1}^{b} (\bar{Y}_{j(i)} - \bar{Y})^2$$

22. Page 471. Table 10.9. In the SS column. The SS for the Error currently reads:

$$\sum_{i=1}^{a} \sum_{j=1}^{b} \sum_{k=1}^{n_0} (Y_{ijk} - \bar{Y}_{ij})^2$$

It should be corrected to read:

$$\sum_{i=1}^{a} \sum_{j=1}^{b} \sum_{k=1}^{n_0} (Y_{j(i)k} - \bar{Y}_{j(i)})^2$$

23. Page 472. Table 10.10 caption…Two-Factor Nested Model~~s~~

24. Page 472. Table 10.10. In the A and B fixed column, the expected mean squares for *A* currently reads:

$$\sigma^2 + bn_0 \frac{\sum_{i=1}^{a} \alpha_i}{a-1}$$

It should be corrected to read:

$$\sigma^2 + bn_0 \frac{\sum_{i=1}^{a} \alpha_i^2}{a-1}$$

12. Page 472. Table 10.10. The expected mean squares for *B*(*A*) currently reads

$$\sigma^2 + n_0 \frac{\sum_{i=1}^{a}\sum_{j=1}^{b} \beta_i^2}{a(b-1)}$$

It should be corrected to read:

$$\sigma^2 + n_0 \frac{\sum_{i=1}^{a}\sum_{j=1}^{b} \beta_{j(i)}^2}{a(b-1)}$$

13. Page 474. As a result, we assume that *A* and *B* are additive; that is we assume $(\alpha\beta\gamma)_{ij} = 0$.

14. Page 476. Example 10.15. …alfalfa plants stop ~~acquiring~~ adding above-ground biomass…

15. Page 479. …temporal autocorrelation. ~~For instance,~~ Examples include *order effects* in which…

16. Page 486. Example 10.20. As a concomitant variable, thorax length (a known predictor of male longevity) was also measured.

17. Page 487. A nonsignificant test for interactions indicates…

18. Page 494. A variant on ANOVA can be used which replaces the sample means and standard error estimates ~~are replaced~~ with trimmed estimates

19. Page 496. ~~1~~`bayes.lm(baby.walk$date, X)`

20. Page 496. Third bullet in Section 10.17.

The design matrix **X** can take on a large number of forms, but…

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21. Page 497. Last bullet in Section 10.17.

…standard uniform priors is presented in ~~the preceding s~~Section 10.16.

22. Page 498. Question 5. …restricted diet of 40 kcal/week after ~~feeding~~ weaning.

23. Page 499. Question 7. Summarize your results., ~~that is~~ In particular, what hypotheses do the…

24. Question 13a. …variance components analysis using `lmer` ~~of the model~~ and…

Chapter 11

1. Page 507. Because the standard normal distribution squared is…
2. Page 508 …that allows testing of the null hypothesis that all $\pi_i = \pi_{i0}$.
3. Page 515. Figure 11.2 caption … (cf Fig. 9.~~12~~13)
4. Page 528. Table 11.3. The first (upper left hand) cell of the marginal table should read 31, not 1.
5. Page 530. Typesetting removed equal and plus signs in the code for Fig. 11.4.

```
paik(survival ~ smoke + age, counts = count, data = whickham,
xlab = "Smoke", leg.title = "Age", ylab = "Proportion surviving")
```

6. Page 535. For naming clarity, the following corrections should be made to R code:

```
PM~~.S~~ = update(PM.SP, ~ . - sex : predation)
SP~~.M~~ = update(SM.SP, ~ . - sex : marrow)
SM~~.P~~ = update(SM.PM, ~ . - predation : marrow)
```

7. Page 536, Table 11.8. The following corrections should be made in column 1: (PM~~,S~~) (SM~~,P~~), (SP~~,M~~)
8. Page 537. We would reject H_0 (although this decision is precluded by the significant three-way interaction) and conclude that marrow and predation are associated when holding sex~~, a~~ constant.
9. Page 537. Section 11.11. …its extension, ~~and~~ the multinomial distribution.

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Additional errors specific to ebook version from CRC

Chapter 4

1. Page 126. The formula for the G_1_unbiased and G_2_ unbiased should be in the footnote on page 126 (not floating between pages 126 and 127).

Chapter 5

1. bars have been left off $\bar{X}$ s throughout the chapter.

Additional errors specific to kindle version

Symbology errors occur in a number of places because of the kindle/pdf translator issues. Please contact me with specific queries.