ERRATA

Misprints, corrections and comments etc., relating to the book

"*Ocean Waves and Oscillating Systems*", ISBN 0-521-78211-2.

List of contents, page vii: The title (heading) of Section 5.9 should not be more than "Motion Response".

Preface, page x, line 3: Between "- - - of the present book." and "I am also in - - -", insert the following sentence: "He and Torkel Bjarte-Larsson, a course participant from 1999, used the computer code WAMIT to work out Figures 5.8 and 5.9."

Page 9, third line above Figure 2.3: "The stored energy is $u_0^2/2$ and" should be "The stored energy is $mu_0^2/2$ and".

Page 11, Table 2.1: $+\ \frac{\hat{x}}{2}e^{-i\omega t}$ should be $+\ \frac{\hat{x}^*}{2}e^{-i\omega t}$

Page 11, third line from below: $u = \hat{x} =$ should be $u = \dot{x} =$.

Page 18, Eq. (2.77): $\hat{F}\hat{u}^* + \hat{F}\hat{u}^* +$ should be $\hat{F}\hat{u}^* + \hat{F}^*\hat{u} +$

Page 20, line 7: $S\omega_0^2|\hat{u}|^2/2$ should be $S\omega_0^{-2}|\hat{u}|^2/2$.

Page 32: Two places in Eq. (2.168), ω should be replaced by ω_0.

Page 35, first line below Eq. (2.192) could preferably be: "If this is not true, we may conveniently subtract the singular part of $H(\omega)$. Let"

Page 35, line 4 from below: "casual" should be "causal"

Page 53, Figure 3.3: R_f should (two places) be R_m

Page 63, line 9: "kinetic" should be "kinematic"

Page 67, fourth line below Eq. (4.64): To be more correct, "Eq. (4.62) and" could preferably be replaced by
"Eq. (4.62) – assuming ω is real – and"

Page 76, Eq. (4.120): $|\hat{\eta}_f|^2 + |\hat{\eta}_f|^2 +$ should be $|\hat{\eta}_f|^2 + |\hat{\eta}_b|^2 +$

Page 76, second line from below: "(cf. Problem 4.8) that" should be "(cf. Problem 4.7) that"

Page 78, Eq. (4.137): "(976 Ws^{-1}m^3) TH^2" should be "(976 $\text{Ws}^{-1}\text{m}^{-3}$) TH^2".

Page 79, last line before Eq. (4.148): "with Eq. (4.146) gives" should be "with Eq. (4.147) gives"

Page 80: Three places in Eqs. (4.152)&(4.153), the lower integration limit h should be corrected to $-h$.

Page 83, Eq. (4.168): $32 \times (10^3$ N $\widehat{=}$ 3.2 tons) should be 32×10^3 N ($\widehat{=}$ 3.2 tons)

Page 83, last line before Eq. (4.170): "Eq. (4.118) as" should be "Eq. (4.169) as"

Page 85, first line after Eq.(4.185): "conjugate. Hence" may be replaced by "conjugate; cf. Eq. (2.139). Hence"

Page 103, line 13: "in Eq. (4.274)," should be "in Eq. (4.273),"

Page 107, Eq. (4.324): $\cos\left(\frac{\omega t - \omega^2 \ell}{g}\right)$ should be $\cos(\omega t - \omega^2\ell/g)$

Page 110: Observe that there is no minus sign in line 3 from bottom: The line reads: $Z_n'(0) = \frac{\omega^2}{g} Z_n(0)$

Page 110, bottom line; and also page 111, line 2: m_m should be m_n.

Page 111, lines 16–18: Three places T should be T.

Page 112, Problem 4.8, line 3: Ae^{-kx} should be Ae^{-ikx}

Page 115, Problem 4.12, two places on line 8: "cos h" should be "cosh"

Page 117, Problem 4.14, line 9: $\eta_r =$ should be $\hat{\eta}_r =$

Page 117, Problem 4.15, line 4: $\eta =$ should be $\hat{\eta} =$

Page 120: The line above Eq. (5.9) should read:

"amplitudes $\hat{\vec{U}}$, $\hat{\vec{\Omega}}$, $\hat{u}_j$ and $\hat{\phi}(x,y,z)$. Thus"

Page 123, Eq. (5.27): $F_{e,j} =$ should be $\hat{F}_{e,j} =$

Pages 131 and 132, in Eqs. (5.77), (5.80), (5.81) and (5.86), a minus sign is missing on the right-hand side, thus: $=$ should be $=$ -

Pages 133 and 135: On the graph of Figure 5.6 and on the upper right graph of Figure 5.7, the symbol ε is used to indicate non-dimensionalised radiation resistance. It would have been better if, instead, the symbol ϵ had been used, because this is the symbol used in the two figure captions, and also in the main text on pages 125, 133, 134, 190, 191 and 192. (Alternatively, the symbol ϵ in the captions and in the main text could have been changed to ε.)

Page 138, lines 8 and 12 of Section 5.3: Replace "introduced; See" by "introduced; see" and "by Eqs. (5.28) and (5.11)" by "by Eq. (5.28) and by Eq. (5.8), (5.9) or (5.11)".

Page 142, In line 4 of the caption to Figure 5.11: Replace $k_3/(\rho g a^2)$ by $k_3/(\pi \rho g a^2)$.

Page 148, Eq. (5.146): $\mathbf{F}_e$ should be $\hat{\mathbf{F}}_e$ and ϕ_0 should be $\hat{\phi}_0$

Page 166: In the last term (the summation term) of Eq. (5.247): Replace q by q' and j by q. Then Eq. (5.247) could preferably read:

$$\hat{F}_{e,j} = \hat{F}_{e,q} \approx \rho g \hat{\eta}_0 S_w \, \delta_{q3} + \rho V \hat{a}_{0q} + \sum_{q'=1}^{3} m_{qq'} \hat{a}_{0q'}$$

Also in Eq. (5.248), $\hat{F}_{e,q}$ could preferably be replaced by $\hat{F}_{e,j} = \hat{F}_{e,q}$

Page 169, Figure 5.19: Below the indicated horizontal still-water surface, a few horizontal dashed lines (as e.g. in Figure 5.18) are missing in the vertical-section upper part of the Figure 5.19.

Page 181: The title (heading) of Section 5.9 should be **Motion Response**.

Correspondingly, the page header on pages 181, 183 and 185 should only be: 5.9 MOTION RESPONSE

Page 184, Eq. (5.323): $S_b/(i\omega)$ should be S_b/ω

Page 186: Eq (5.332) should read: $Y_i(\omega) = i\omega H_i(\omega)$.

Page 192, line 1: "the resistance" should be "the radiation resistance".

Page 194, Problem 5.15(b), line 4: "heave velocity is given" should be "heave velocity is given as".

Page 203, first line below Eq. (6.21): "where $Z_{u,j}(\omega)$ is a load" should be "where $Z_u(\omega)$ is a load".

Page 207, line 7 below figure caption: $E_{u,P} > 0$ should be $W_{u,P} > 0$

Page 207, line 8 below figure caption:

"a principle[67] which" should be "a principle[66,67] which"

Page 208: On Figure 6.8, the minus sign should be a plus sign. Accordingly, in the third line of the figure caption, "Deducting from" should be replaced by "Adding to".

Page 209, last line: "and $X_i(\omega) = \mathrm{Im}Z_i(\omega)$, respectively." should be "and $iX_i(\omega) = i\mathrm{Im}Z_i(\omega)$, respectively."

Page 211, lines 5-6: Replace

"The following paragraphs, as an example, give - - -" by

"The following paragraph, as an example, gives - - -"

Page 211, lines 20, 21, 22 and 27 (four places): $E_{u,P}$ should be $W_{u,P}$

Page 214, second line below Eq. (6.62): $\hat{\mathbf{u}} = \hat{\mathbf{U}} + \hat{\boldsymbol{\delta}}$ should be $\hat{\mathbf{u}} = \mathbf{U} + \boldsymbol{\delta}$

Page 229: Eq. (7.28) should be: $P_r = \frac{1}{4}\hat{p}_k\hat{Y}^*_{kk}\hat{p}^*_k + \frac{1}{4}\hat{p}^*_k\hat{Y}_{kk}\hat{p}_k = \frac{1}{2}G_{kk}|\hat{p}_k|^2$

Page 242: The first line of Eq. (7.99) should read:

$2\mathcal{P}_r = \hat{\mathbf{u}}^\dagger(\mathbf{Z}\hat{\mathbf{u}} + \mathbf{H}\hat{\mathbf{p}}) + \hat{\mathbf{p}}^T(\mathbf{Y}^*\hat{\mathbf{p}}^* - \mathbf{H}^\dagger\hat{\mathbf{u}}^*)$

Page 245, Eq. (7.123): ϕ should be $\hat{\phi}$

Page 250, line 3: $\mathbf{H}^T = -\mathbf{H}$ should be $\mathbf{H} = \mathbf{H}_{up} = -\mathbf{H}_{pu}^T$

Page 254, first line below Eq. (7.189): "vectors φ_u and φ_p" should be "vectors $\boldsymbol{\varphi}_u$ and $\boldsymbol{\varphi}_p$"

Page 256, fourth line above Eq. (7.200): "heave mode 2 (i.e.," should be "heave mode (i.e.,"

Page 260, three last lines: Four places, $\hat{\boldsymbol{\delta}}$ should be $\boldsymbol{\delta}$

Page 272, left column: Between lines 27 and 28 insert:

intrinsic mechanical impedance, 184, 203, 204

intrinsic mechanical resistance, 205

Page 273, right column: Line 12 from below should read:

matrix singularity, 172, 174, 175, 181, 196, 213, 218, 221

Page 275, right column, line 6 from below: "chanel" should be "channel"

Comments, additional information, etc.

Page 26: Comment to the first line after Eq. (2.128): Eq. (2.147) proves this statement of commutativity.

Page 57: In the text of Problem 3.8, on the third line, "Eqs. (3.42) - (3.45)" could be changed to "Eqs. (3.42) - (3.46)" provided the following is added at the end of the expression on the second line: $= 1 - |1 - 2R_r\hat{u}/\hat{F}_e|^2$

Page 59: Concerning derivation of Eq. (4.12): From the equation

$$\nabla(\partial\phi/\partial t + v^2/2 + p_{tot}/\rho + gz) = 0 \qquad (4.11)$$

it follows that $\partial\phi/\partial t + v^2/2 + p_{tot}/\rho + gz = C(t)$ is independent of the spatial coordinates x, y and z. However, without loss of generality, we may assume that $C(t)$ is a constant independent of time, because our mathematical auxiliary function, the velocity potential, may be redefined by $\phi' = \phi - \int^t C(t)dt$. As the difference between ϕ' and ϕ does not depend on the spatial coordinates, but only of the time, the physical quantity, the fluid velocity, $\vec{v} = \nabla\phi' = \nabla\phi$ is unambiguous. Hence, Eq. (4.12), which results when we replace $C(t)$ by the constant C, is sufficiently general.

Page 62, second line below Fig. 4.5:
"depends on t" might preferably be replaced by "depends on x, y and t.".

Page 73, last line of Eq. (4.120) may preferably be extended to read:

$$= \left[1 - \left(\frac{\omega^2}{gk}\right)^2\right] kh + \frac{\omega^2}{gk} = (2\omega/g)v_g = (2k/g)v_p v_g \qquad (4.111)$$

Comment 1: Thus, the somewhat complicated mathematical function $D(kh)$ has been more simply expressed by the physical quantities v_g and v_p, the group and phase velocities.

Comment 2: See also the last paragraph before Subsection 5.5.6 (p.159).

Comment 3: Note that the fraction $[\rho g^2 D(kh)/4\omega]$, appearing in several equations, e.g. on pages 77-78, may alternatively be written as $(\rho g/2)v_g$.

Page 74, line 9: After "(see Problem 4.12)." may be inserted/added

"This maximum occurs for $\omega^2 h/g = 1$.".

Pages 83-87, comments related to Section 4.5: As β, ω and f have SI units rad, rad/s and Hz, equations on e.g. page 86 reveal that S, s and s_ω have SI units $\mathrm{m^2/Hz}$, $\mathrm{m^2/(rad\,Hz)}$, and $\mathrm{(m/rad)^2 s}$, respectively. According to Eq. (4.197) then the function $A(\omega, \beta)$ has SI unit $\mathrm{m\,s\,(rad)^{-2}}$, which also agrees with Eq. (4.178). An analogous, but different, discrete-frequency quantity A_j used by some other authors [see e.g. equations 2.22, 2.23 and 2.38 in Faltinsen's book *Sea Loads on Ships and Offshore Structures*] has SI unit m.

Page 117, Problem 4.15: The text on lines 4–7 ("Derive an expression for - - - nowhere an accumulation of energy.") may be replaced by

"For the superposition of these two plane waves, derive an expression for the intensity

$$\vec{I} = \overline{p(t)\vec{v}(t)}$$

which, by definition, is a time-independent vector. Further, referring to Subsection 4.4.4 (pp. 77–78), show that the wave-power-level vector may be expressed as

$$\vec{J} = (\rho g/2)v_g) \left[\vec{e}_x \left(|A|^2 + |B|^2 \cos\beta\right) + \vec{e}_y |B|^2 \sin\beta\right] + \vec{s}\,(x,y)$$

where the spatially dependent vector $\vec{s}\,(x,y)$ is solenoidal. Find an expression for $\vec{s}\,(x,y)$, and show explicitly that $\nabla\cdot\vec{s} = 0$, which has the physical significance that there is nowhere, in the water, accumulation of any permanent wave energy (active energy — but possibly only of reactive energy —)."

Page 185: In order to insert an additional comment, the second line after Eq. (5.327) could be replaced by: "cylinder is relatively high ($l/a \gg 1$). For the floating, truncated, vertical cylinder discussed in Subsection 5.2.4 (cf. Figure 5.7), condition $l/a \gg 1$ is not satisfied, and the added mass appears to exceed the value given by Eq. (5.327) by a factor in the range between 1.4 and 1.7. If $l \gg a$, we have $m_m \gg m_{33}$ and the angular".

Page 201, inequalities (6.13):

When deriving inequality (6.14), Budal[67,68] considered a tall cylindrical body with relatively small water-plane area. Then, with optimum phase ($\gamma_3 = 0$), the heave amplitude $|\hat{s}_3|$ may be significantly larger than the wave amplitude $|A|$. Inequalities (6.13) are based on this assumption. However, for a wave-interacting low cylindrical body with relatively large water-plane area, the heave amplitude should not exceed the wave amplitude. Moreover, the excitation force amplitude is bounded by the body's buoyancy force at equilibrium in still water. In this case, inequalities (6.13) are to be replaced by

$$|\hat{u}_3| < \omega|A|, \qquad |\hat{F}_{e,3}| < \rho g V/2,$$

as suggested by Rod Rainey [Rainey, 2003, private communication]. This alternative to inequalities (6.13) leads, however, to the same fundamental result, Budal's upper bound (6.14).

Page 205: The last line of Eq. (6.30) could alternatively be written as:

$$= \frac{2}{\pi}\int_0^\infty \left\{\frac{|F_e(\omega)|^2}{8R_i(\omega)} - \frac{\alpha(\omega)}{8R_i(\omega)}\right\} d\omega$$

Corresponding changes in Eqs. (6.33) and (6.35) would make comparison with Eq. (6.25) more direct and easy.

Page 263, Bibliography, entry # 7:

The review prepared by the ECOR (Engineering Committee on Oceanic Resources) Working Group on Wave Energy Conversion, has been published as a book by Elsevier 2003 under the title "*Wave Energy Conversion*" (ISBN 0-08-044212-9).

Errata list created 2002-04-26 (020426).

Revised 020503/020829/031230/050204/050613/051017/060706/070815-/080211/101217/120313