

List of Errors and Corrections

Corrections to and comments on “Surface Waves” by J. V. Wehausen and E. V. Laitone, *Encyclopedia of Physics*, Volume 9, pp. 446–778, Springer-Verlag, Berlin-Göttingen-Heidelberg, 1960. This list has been compiled by the first author.

Identification of locations: First by page number, then by formula number: (x.y), or by line identification: n lines from top or bottom, or (x.y)+ n to indicate n lines after formula (x.y), or something similar. If a formula number (x.y) consists of several equations, a subscript will be used to identify the one intended: e.g., (x.y)₃ for the third equation.

I am grateful to the many colleagues who have informed me of errors. Without their help the list would be much less complete.

- p. 447, line 2: “und” should be “and” .
- p. 449, (2.10’): delete + following $\frac{1}{2}$.
- p. 452, (3.4): a – should precede the term $\mu(w_y + v_z)$.
- p. 453, (3.8’): delete the exponent $\frac{1}{2}$ in the two denominators where it occurs.
- p. 454, footnote: in the last term on the right $F_{,j}$ should be $F_{,i}$.
- p. 457, (7.5), comment: (x, y) must be submerged.
- p. 460, (8.8): In the last integral d_s should be ds .
- p. 461, (9.4)+1: “orce fon” should be “force on” .
- p. 468, (10.34): the correctness of the fifth equation has been questioned.
- p. 469, 4 lines from the top: (10.32) should be (10.33).
- p. 469, (10.36)–2: $\alpha\eta^{(01)}$ should be followed by a +.
- p. 475, line 3: for $\phi(x, y)$ read $\phi(x, z)$.
- p. 475, (13.8)+8: for $(x - \alpha)^2$ read $(x - a)^2$.
- p. 475, (13.9)+2: delete the final “n” from “ben” .
- p. 479, (13.21): in the third term on the first line the denominator should be r_1^{n+2} .
- p. 481, bottom equation: in the exponential term c should be \bar{c} .
- p. 482, (13.31)₂: the two occurrences of $-\frac{(-1)^{n-1}}{(n-1)!}$ should be replaced by $\frac{1}{(n-1)!}$.
- p. 482, (13.31)₃: the two occurrences of $\frac{(-1)^{n-1}}{(n-1)!}$ should be replaced by $\frac{1}{(n-1)!}$.
- p. 482, the unnumbered formula below (13.31): the + following $\log r$ should be – .
- p. 483, (13.34): in the second line $-\frac{e^{-kh}}{k}$ should be $+\frac{e^{-kh}}{k}$; in the last line $\sin \sigma t$ should be $\cos \sigma t$.
- p. 484, (13.35)₅: $\text{grad } \phi = O([(x - a)^2 + (z - c)^2]^{-1/4})$ as $x \rightarrow \infty$.

- p. 484, (13.37): in each of the two integrals the terms on the second line should be inserted in the numerator after the two cosh terms so that all four terms multiply $(k \cos^2 \theta + \nu)$. I would also like to call attention to the fact that a “corrected” version of this equation in my article on wave resistance in *Advances in Applied Mechanics*, **13**, equation (3.51b) is also in error because of some misplaced multipliers.
- p. 485, (13.38): in the last line there is a missing } before $\sec^3 \theta$.
- p. 489, (13.43): in the third line the denominator should be $u - \bar{c}$; in the fifth line the exponent should be $-i\nu(z - \bar{c})$.
- p. 490, (13.46-48): in order that $f(z) \rightarrow 0$ as $x \rightarrow \infty$, one must subtract a term $\frac{Q\nu}{2(\nu h - 1)}(z - a + ih)$ from (13.46), add a term $\frac{\Gamma\nu(b+h)}{2(\nu h - 1)}$ to (13.47), and add a term $\frac{M\nu}{2(\nu h - 1)} \cos \alpha$ to (13.48).
- p. 491, 11 lines from top: second term on right-hand side should be mr_1^{-1} .
- p. 492, (13.49): on the last line, in the exponential term α should be a .
- p. 495, (13.54): the numerator in the second term should be $\Gamma(t) - iQ(t)$.
- p. 496, (14.2)+3: add to the equation “, $A = a\sigma/g$ ” and to the equation below add “, $A = (a\sigma/g) \cosh m_0 h$ ” .
- p. 497, lines 9 and 10 from bottom: the final t on line 9 should be interchanged with the final period on line 10.
- p. 497, line 6 from bottom: $\chi(x, y)$ should be $\chi(x, z)$.
- p. 498, (14.6): in the second line the right-hand side should be $(\sigma^2/g)^2$.
- p. 498, (14.11)–2: last word should be “depth” .
- p. 504, (14.35)+10: (14.39) should be (14.33).
- p. 511, (15.11)+14: insert “near the observer” after η_R .
- p. 512, second displayed formula: the numerator in the third term should be $-k_1' x^2/t^2 - \sigma(k_1) + \sigma'(k_1)k_1'(x/t^2)t$.
- p. 515, line 4: $2\rho g$ should be ρg .
- p. 515, top graph on the right and bottom one on left: in second displayed formula $\sigma =$ should be $\sigma' =$. In bottom graph on right in second formula numerator of last term should be $2Tk^2/\rho g$.
- p. 519, (15.23): the lower limit for the integral should be $-h$.
- p. 520, (15.28): in the first summation σ should be σ_j .
- p. 520, (15.29)–1: $+b_j$ should be $+ib_j$.
- p. 521, second displayed formula after (15.33): at the end of the formula $dy dx$ should be $dy]dx$.
- p. 523, (16.4)-1: add an “s” to “function”
- p. 527, six lines from bottom: $[A_1^2 + B_1^2]$ should be $[A_1^2 - B_1^2]$.

- p. 527, (17.2): in the coefficient of the second term m_0^2 should be $m_0^{(2)}$.
- p. 528, (17.3)+3 and 4: in each occurrence the word “wave” should be followed by “potential”.
- p. 528, (17.3)+7: I note that I have inserted a comment at the bottom of the page:
 If A_1, B_1, A_2 are actually wave amplitudes then with $R = |B_1/A_1|$, $T = |A_2/A_1|$,
 $R^2 + T^2[\cosh m_1 h_1 / \cosh m_2 h_2]^2 = 1$.
- p. 529, 15 lines from bottom: $= 0$ is missing from the equation that begins $\Phi_{tt} + \dots$.
- p. 529, bottom line: l should be $-l$.
- p. 530, line 3: in the second equation f_1 should be νf_l .
- p. 531: in the middle of the page the sentence beginning “Let $E_1 = \dots$ ” D should be D_1 .
- p. 532, (17.4): in the second equation $+\beta_T$ should be $-\beta_T$.
- p. 537, line following β) *Waves on beaches*: The first inequality statement should be replaced
 by $\tan \gamma \geq \frac{-y}{x} \geq 0$; in the next line α should be γ .
- p. 540, line 4: eliminate the word “both”.
- p. 541, (17.52)+3: “or” should be “of”.
- p. 543, (18.4): in the third equation ν should be m .
- p. 544, (18.9): $\cos \theta$ should be $\cos n\theta$.
- p. 545, (18.11)–2: Y should be y .
- p. 547, (18.24): The upper limit of the integral should be $+y$ and the term beginning $-2\pi i$
 should begin $+2\pi i$.
- p. 547, (18.25)₄: the last term should begin k_1^2 .
- p. 550, (18.33): in the summation the argument of the exponential on the first line should
 terminate with $\gamma]$, as in the similar exponential on the second line.
- p. 551, line 2: $\cos(z - \zeta)$ should be $\cos k(z - \zeta)$.
- p. 556, (19.11): I have the following note in the margin: Here \mathbf{n} points out of S_1 .
- p. 558, (19.24): eliminate superfluous $+$.
- p. 563, Fig. 18: the numbers in the abscissa scale should be multiplied by π .
- p. 566, (19.66): read $\Phi_f = \text{Re}\{-i\sigma[\varphi^1 a_0 + \varphi^2 b_0 + \varphi^3 c_0 + \varphi^4 \alpha_0 + \varphi^5 \beta_0 + \varphi^6 \gamma_0]e^{-i\sigma t}\}$.
- p. 570, (20.17)–1: for (20.10) read (20.16).
- p. 575, (20.42): in the second integral the upper limit should be z .
- p. 575, (20.45): for second term read $f_2 = \Re\{f_1\}$.
- p. 576, (20.51)+11: (1939b) should be (1936b).
- p. 578, (20.60)–11: (1958) should be (1959).
- p. 581, (20.69)₁: in numerator of first coefficient eliminate c .

- p. 585, the second of two lines in the middle of the page: delete the final “s” in “summations”.
- p. 592, (20.101)+1: “There” should be “These” .
- p. 593, (21.1): replace $p(x, y, zt)$ by $p(x, z, t)$.
- p. 593, (21.3)₂: $-i\sigma$ should be $+i\sigma$; lower limit of third integral should be 0; the sign of the last term should be changed from + to - .
- p. 593, (21.4): same as (21.3).
- p. 594, (21.6): in both lines the initial signs should be changed; the second integral in line one goes from 0 to ∞ .
- p. 594, (21.6)+1: “simpel” should be “simple”.
- p. 594, (21.7): the right-hand side should be preceded by a - .
- p. 594, (21.7)+2: 1953 should be 1958.
- p. 594, (21.7)+5: lower limit should be 0 .
- p. 594, (21.7)+6: I have written a note at the bottom of the page: Note that these are not really ‘sources’, for the source at $y = b$ is accompanied by a sink at $y = -b$. As $b \rightarrow 0$ these two cancel and the integral above is left.
- p. 595, (21.10): the sign of each term should be reversed.
- p. 596, (21.16): the right-hand side should be preceded by a - sign.
- p. 596, (21.17): both terms on the right should be preceded by - signs.
- p. 596, (21.18): the right-hand side should be preceded by a - sign.
- p. 597, (21.19), (21.21), (21.22): in all these equations the signs on the right-hand sides should be changed.
- p. 597, line 2 from bottom: c should be $c > 0$.
- p. 598, (21.26): on the third line, the exponent $-\nu \sec^3 \theta$ should be replaced by $\nu y \sec^3 \theta$.
- p. 599, (21.30)+1: after “potential” insert “as calculated by Lunde (1951b),”.
- p. 600, (21.34): on the first line, p in the denominator should be ρ ; in the second denominator replace \sec^2 by $\sec^2 \theta$.
- p. 604, (22.1): the = in the second term should be deleted.
- p. 604, (22.4): on the first line, in $G(\dots)$ and $G_t(\dots)$ the correct arguments should be $(x, y, z; \xi, 0, \zeta; t, \tau)$.
- p. 604, (22.4)+6: replace ξ, ζ by ξ, η, ζ in the first occurrence of G .
- p. 605, (22.8): the upper limit for the two single integrals should be t ; a subscript t should be added to the G in the third line and removed from the G in the fourth line.
- p. 606, line 4: the multiplier of Φ_t should be $-\frac{1}{2}$.
- p. 606, second displayed formula - 1: replace “ f, F ” by “ $\eta(x, z, 0), \eta_t(x, z, 0)$ ” .

- p. 609: in the first group of three equations determining K , multiply the second equation by $2/\pi$ and the third equation by $1/\pi$; in the second group of three equations determining K , divide all terms by π ; in the third equation (single line) determining K delete π from the coefficient; in (22.20) and all three equations of (22.21) replace π^2 by π .
- p. 613, (22.42)+2 and 5: in line 2 delete "of"; in line 5 insert "in" before "the form".
- p. 615, lines 1 and (22.50)–5: delete " 's" in "Green's".
- p. 615, (22.49): an overbar is missing over $gk \tanh kh$.
- p. 616, lines 7, 15, 26, 28: eliminate the " 's" in "Green's".
- p. 616, (22.52)+2: delete the final "s" in "computations"; in the next line (1937) should be (1939).
- p. 618, (22.60): insert $J_0(kR)$ before $\sigma(k)$.
- p. 619, (22.65)+2: delete " 's" in "Green's".
- p. 620, line 3: replace "an analytic" by "a closed".
- p. 623, (23.13)+13: replace "McKnown" by "McNown".
- p. 628, (23.35)₁: in the second term replace \bar{x}_y by \bar{x} .
- p. 631, line before **24. Gravity waves**: replace "with" by "within".
- p. 633, (24.13)+1 and +3: in line 1 delete the 2 before ρg ; in line 3 replace 0.33 by 0.47.
- p. 636, (24.31)–3: (24.38) should be (24.28).
- p. 637, second displayed equation: the \pm should be reversed.
- p. 637, (24.32)–5 (constant c): according to a marginal note c has been found by Pursco (reference missing); $c = [\sqrt{3}(2 - \sqrt{3})]^{-1} = 2.1547$.
- p. 640, (25.1)₁: w_y should be w_z .
- p. 641, (25.10)+1: delete "n" in "wheren".
- p. 642, (25.23): for $T'\omega^3$ read $T'm^3$.
- p. 644, (25.39)+3: read "he" for "the".
- p. 645, line 3: for ω_1 read ω .
- p. 646, line 18: for "Pulsing" read "Pulsating".
- p. 647, (26.3)–2: for (26.1) read (26.2).
- p. 654, (27.2): the last term on the left should be $c\eta_x$.
- p. 655, (27.7)₂: in the second line +grad should be –grad; in the third line $+\eta^{(1)}$ grad should be $-\eta^{(1)}$ grad, and $-T'$ should be $+T'$.
- p. 655, (27.8): in the first equation C_0 should be c_0 ; in the next line (27.9) should be (27.6).
- p. 657, line 6: "seen" should be "seem".
- p. 657, last displayed equation: in the last term it should be $\sin nm x$.

- p. 658, (27.25): I have a ? beside the = in front of A' .
- p. 659, (27.30): $\cos m$ should be $\cos mx$.
- p. 660, (27.34): A should be A' , where $A' = A \left\{ 1 + A^2 m^2 \frac{2 \sinh^4 mh + 14 \sinh^2 mh + 3}{16 \sinh^4 mh} \right\}$.
- p. 661, (27.43): in the double integral the limits of the second one should be $-\infty$ and η .
- p. 662, (27.45): on line two, in both the exponential and the denominator $(m_1 - m_2)$ should be $|m_1 - m_2|$.
- p. 664, (27.55): in the second equation c_0 should be σ_0 .
- p. 664, (27.55)+4: replace “they” by “these” .
- p. 664, (27.56)₂: in the last line $\cos 2my$ should be $\cos 2mx$.
- p. 665, (27.60)₂: there should be a bracket] after $\cos 3mx$.
- p. 666, line 8: in the margin I have written Concus (1962).
- p. 666, (27.63)_{1,2}: In line 2 the second appearance of $\coth^2 mh$ should be preceded by a + and not a - ; in the fourth line the initial + should be - .
- p. 666, (27.67): I have added an extra term $+A^2 \sigma_0 m \exp(-4\nu m^2 t) \sin 2my$ together with a reference to Longuet-Higgins [1960, p. 296] for a correction to Harrison.
- p. 668, line 12: after “converges” insert “asymptotically” .
- p. 683, (30.22)+8: χ_n should be χ_u .
- p. 695, (30.47)+8: delete first t in “relations” .
- p. 715, line 5: insert “irrotational” before “motion” .
- p. 715, (32.1)-2: φ should be Φ .
- p. 717, (32.17)+1: after “transport” insert “velocity” .
- p. 720, (32.44)-1: for (32.88) read (32.38).
- p. 721, (32.48): before the integral insert $1/\lambda$. I have the following note in the margin: See Longuet-Higgins, Proc. Roy. Soc. Lond., Ser. A **342** (1975), p. 163.
- p. 721, (32.50): at the end of the right-hand side insert $> \frac{1}{2}$.
- p. 725, middle of the page: beside the reference to Lamb I have written: Lamb does not assume irrotational motion.
- p. 728, (32.89)+1: for “It” read “If” .
- p. 730, (32.104): the factor preceding the integral should be $\frac{1}{6\pi}$; the limits should be $-\pi$ to π .
- p. 734, (33.24): $\sqrt[3]{2}$ should be $\sqrt[3]{2}$, i.e. $2^{1/3}$.
- p. 744, (34.49)+5: At the end of the sentence I have written “See also Boussinesq (1877)” .
- p. 755, end of paragraph beginning with Moiseev: in the margin I have written: Seems to contradict p. 570 and Gerber.

- p. 767, Kochin, fifth entry: “Sobranie” is misspelled.
- p. 769, before Lewy: insert Lewis, D. J.: The instability of liquid surfaces when accelerated in a direction perpendicular to their planes.II. Proc. Roy. Soc. Lond., Ser. A **202**, 81–96 (1950).
- p. 770, McKnown: should be McNown.
- p. 775, after Tamiya insert: Taylor, G. I.: The instability of liquid surfaces when accelerated in a direction perpendicular to their planes.I. Proc. Roy. Soc. Lond., Ser. A **201**, 192–196 (1950).