Errata: Mechanics and Symmetry

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We appreciate being informed about additional corrections. We do not include all stylistic or spelling corrections in this list. Additional corrections can be sent to `marsden@cds.caltech.edu`. We are especially grateful to Anthony Bloch, Hermann Flaschka, Meinhard Mayer, Peter Mucha, Juan-Pablo Ortega, and other readers for notifying us of corrections.

Errata

Chapter 1—Introduction and Overview

- `Page 2, 4 lines before equation (1.1.1)`: the second L should have a dependence on t included.
- `Page 4, In equation (1.1.14)`: the ∂ in the denominators of the right hand sides of equations should be δ.
- `Page 9, the equation displayed after equation (1.3.2)`: the c should be C.
- `Page 13, In the third paragraph`: delete the reference to Chapter 13 (this chapter will appear in a future volume).
- `Page 14, line 1`: add a question mark at the end of the line.
- `Page 20, the line after (1.6.6) should read`: "where $\delta F/\delta \mathbf{E}$ and $\delta F/\delta \mathbf{B}$are vector fields with $\delta F/\delta \mathbf{B}$ *divergence free* defined in the" and two lines after (1.6.7), delete the "div".
- `Page 34, on the bottom line`: **1.10-3** should be **1.10-4**.
- `Page 36, line 4↑`: φ should be θ.

Chapter 2—Hamiltonian Systems on Linear Symplectic Spaces

- `Page 52, line 7`: Crough should be Crouch.
- `Page 61`: (2.4.10) should be to the preceding display.
- `Page 62, in the line right after the box`: the first Ω should be Ω_z.
- `Page 67, in 2.6-1(b)`: omit the part of the first sentence preceding "show that".
- `Page 68, line following equation (2.7.7)`: the reference to 3.1 should be to 3.2.
- `Page 69, line 7↑`: omit the first (.
- `Page 70, in Exercise 2.7-3`: ϕ should be assumed to be a linear symplectic map.
- `Page 74, on line 6↑`: insert a minus sign after the last equals sign.
- `Page 78, line 8`: insert] before the }.
- `Page 81, in the lower part of Figure 2.10.4`: the arrows on the right hand side are going in the wrong direction.
- `Page 83, the line after (2.11.4) should read`: "From this point of view, θ gets identified with time and the curve", two lines below this, (2.11.2) should be (2.11.4) and on line 5↑, $\bar{x}_0(0)$ should be $\bar{x}(0)$.
- `Page 83 The proof of Theorem 2.11.1 requires corrections`: please request the corrected file if needed.
- `Page 86, Example C(iii)`: add a (before "transversal".

Chapter 3—An Introduction to Infinite-Dimensional Systems

- `Page 99, in line 5`: the H should be H_1 and in line 4↑, H should be h.
- `Page 100, in line 2↑`: $u_t d^3x$ should be $u_t dx$.
- `Page 104, in (3.3.6)`: $P_x(\varphi)$ should be $P_x(\varphi, \pi)$.
- `Page 105, on line 3`: §3.3 should be §3.2. In (3.3.11) delete the period.
- `Page 107, in` F_1: the u^3 should be u^2 and in F_3 the first plus should be a minus, and there should be a factor of $\frac{1}{2}$ in front of the $(u_{xx})^2$ term.

Chapter 4—Interlude: Manifolds, Vector Fields, Differential Forms

- `Page 117, line 7`: 4.2.4ii should be 4.2.4iv.
- `Page 119, last line of 1(a) in the box`: $\mathbf{e}^3$ should be $\mathbf{e}_3$.
- `Page 121, in (4.3.5)` : add (x) at the end of the equation.
- `Page 122, in line 7↑`: μ should be μ_2 and in the next line, Q should be a zero.

Chapter 5—Hamiltonian Systems on Symplectic Manifolds

- `Page 133, in line 2↑ and in (5.1.3)`: replace $[n/2]$ by $n(n-1)/2$.
- `Page 134, In the line following (5.2.1)`: P should be P_1.
- `Page 143, Just below the middle of the page, in the last line of the display`: Ω_z^* should be $\Omega_z^\flat$.
- `Page 146, At the end`: **5.4-2** should be **5.4-3**.

Chapter 6—Cotangent Bundles

- `Page 149, In line 8↑`: **6.1.6** should be **6.1.1**.
- `Page 151, In line 12`: α_i should be α_j and three lines below that, B^i should be B^j (twice) and $= p_i^0$ should be p_j^0.
- `Page 152, Exercise 6.6.2`: add "$\circ\, \mathbf{d}f$" to the end of the line.
- `Page 154, In line 3`: Delete the extra)
- `Page 162`: Replace the sentence after (6.8.1) "However, one really,..." by "However, at a fixed point, one really wants to use the given symplectic form evaluated at the fixed point, which has the expression $d(\delta q^i) \wedge d(\delta p_i)$, (6.8.2) while (6.8.1) restricts to zero."
- `Page 164`: Delete the text from line 9↑ to the third line after (6.8.11) on page 165. Also delete the last sentence of the paragraph including formula (6.8.12).

Chapter 7—Lagrangian Mechanics

- `Page 166`: the ∂ in the first line of (6.8.16) for dp_i/dt should be a d and in the third line, w^i should be w_i .
- `Page 182, line 2↑`: add a) before the right hand angle bracket.

- Page 191, Section 7.9 has been rewritten: if you are reading this section, please request a revised copy from the authors.
- Page 198, line 1: **7.8-2** should be **7.9-2**.

Chapter 8—Variational Principles, Constraints, Rotating Systems

- Page 219, In problem 8.1-2: insert a minus sign in front of the right hand side.

Chapter 9—An Introduction to Lie Groups

- Page 244, on the last line: ϕ_2 should be ϕ_{g_2} and ϕ_1 should be ϕ_{g_1}.
- Page 245: the two g's in the left hand side of the figure should be h's.
- Page 251, in the first line of Example (b): it should be $\mathfrak{g} = L(\mathbb{R}^n, \mathbb{R}^n)$.
- Page 255, in line 3↑: $\phi(x)$ should be $\phi^{-1}(x)$ and in the second line of the remark, banach should have a capital B.
- Page 258, in line 3↑: a_4^2 should be a_3^2.
- Page 259, in line 3: $\mathbb{R}$ should be $\mathbb{R}^3$ and in the 4th line of the proof of **9.2.5**, $|\lambda|$ should be $|\lambda|^2$.
- Page 261, in the line above (9.2.7): the superscript $2n-1$, should be $n-1$.
- Page 262, in the first line of Proposition 9.2.8: "nonconnected" should read "connected".
- Page 263, line 5 at the end of the line: in the expression for A^T, swap w and z.
- Page 265: the last x in the first display should be z.
- Page 270, in line 2 of (b): delete the redundant "for $\mathbf{x} \in \mathbb{R}^3$ and $A \in SO(3)$".
- Page 274, in line 4: $\Phi_g(\exp t\xi, \Phi_{g^{-1}}(x))$ should be $(\Phi_g \circ \Phi_{\exp t\xi} \circ \Phi_{g^{-1}})(x)$.
- Page 276, in line 5 of Remark 3: the second Ad should be ad.
- Page 277, three lines above part (c): $\mathfrak{l} = \{B \in$ should be $\mathfrak{l} = \{A \in$.
- Page 279, line 3↑: $\eta(0) = \eta$ should be $\eta(0) = 0$.

Chapter 10—Poisson Manifolds

- Page 289, In (10.2.13): the last **a** should be **b**.
- Page 290, In the first line of Exercise 10.2-4: change G to H.
- Page 297, line 4 of Proposition 10.5.2: the last $=$ should be $\in$.
- Page 299-300, 307-308, 313: the symbols $\mathcal{L}$ should be £ (the Lie derivative).
- Page 307, in Exercise 10.6-2: delete the reference to the nonexistent exercise 5.5-4.
- Page 308, line 2: multiply the second term on the right hand side by F and the third by G.
- Page 309, line 8↑: the sub π should be on line.
- Page 315, in line 9: z should be Z.
- Page 317, at the end of line 4: T_xM should be T_x^*M.
- Page 320, in (10.9.13): the second two μ's should be ν's.
- Page 321, in line 3↑: $B(\mu)$ should be $\langle \cdot\,, \mu\rangle$.
- Page 321, on lines 4 and 8↑: V should be V^*.

Chapter 11—Momentum Maps

- Page 328: J should be $\mathbf{J}$.
- Page 330, in Exercise 11.4-1: the reference should be to equation (10.7.3).
- Page 331: insert a minus after the last $=$ in (11.5.6) and in line 5↑, $(\mathbf{p})$ should be $(\mathbf{q}, \mathbf{p})$.
- Page 333, second line after (11.5.16): $\mathfrak{g}^*$ should be $\mathfrak{g}$.

Chapter 12—Computation and Properties of Momentum Maps

- Page 340, line 8↑: add (at the beginning of the line.
- Page 342, line 2↑: the last $g \cdot \alpha_q$ should be $g \cdot q$.
- Page 344, line 12: $\xi_P(p) = d/dt|_{t=0} T_p\varphi_t$ should be $\xi_P(v_q) = d/dt|_{t=0} T_q\varphi_t(v_q)$.
- Page 345, in (12.3.1): N should be $3N$.
- Page 351, in Exercise 12.3-4: in the integral, the J should be bold.

- Page 352, line 7: the (after the second = should be $\langle$.
- Page 356, on the line after (12.4.26): the $\mathfrak{g}$ should have a prime on it.
- Page 360, in Exercise 12.5-3: $F_{F\circ J}$ should be $X_{F\circ J}$ and the last J on the line should be bold.

Chapter 13—Euler-Poincaré and Lie-Poisson Reduction

- Page 371, line 10↑: ξ_Q should be ξ_G.
- Page 379, line 8↑: $T^*_{g(t)}L$ should be $T^*_eL_{g(t)}$.
- Page 380, the proof of 13.6.2 is incomplete: please ask the authors for the complete proof if needed.
- Page 392, line 6↑: ∂x^b should be $\partial \xi^b$.
- Page 395, three lines after (13.8.22): delete the minus sign in $u_t = -$....

Chapter 14—Coadjoint Orbits

- Page 400, in the first line of (14.1.1): $\mathbf{A}^{-1}\hat{\mathbf{v}}$ should be $(\mathbf{A}^{-1}\mathbf{v})\hat{}$.
- Page 401, in the line above Example (c): β-axis should be α-axis.
- Page 413, at the end of Example (b): the expression for the orbit symplectic structure should be $\omega^- = (1/\beta)d\alpha \wedge d\beta$ and on the preceding line, "in coordinates (q, p)" should be "in coordinates (α, β)."
- Page 421, in line 8: "ab" should be "ad".
- Page 423, in (14.8.12): the matrix associated with $\mathbf{X}_2$ should be $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ and in the right hand part of figure 14.8.1, the axes should be relabeled: a should be c, c should be $a - b$ and b should be $a + b$. In the caption, $\mathfrak{se}(3)^*$ should be $\mathfrak{se}(2)^*$.
- Page 430, in Exercise 14.9-3: on the last row of the matrix g, interchange a and b and add the condition $|a|^2 - |b|^2 = 1$.

Chapter 15—The Free Rigid Body

- Page 437: Figure 15.3.1 (and on the cover) shows the case $I_1 < I_2 < I_3$. Add this to the figure caption.
- Page 438, in equation (15.4.6): delete the stray apostrophe.
- Page 450: The sum preceding (15.9.4) should start at $i = 1$.

- `Page 451, on line 9`: longest should be shortest.
- `Page 451, on line 16`: short should be long.
- `Page 455, in the expression for` a_{66} `on the line following (15.10.7)`: there should be a factor of 2 in front of the last term, $\Pi_3^0 d$.
- `Page 456, in the second displayed equation`: the second factor (multiplying the big squared term) should be

$$\left[a_{66}\left(\frac{1}{I_3}+a+c\right)-a_{36}^2\right]$$

- `Page 456`: equation (15.10.10) should read

$$a_{66}\left(\frac{1}{I_3}+a+c\right)-\left(\dot{\Phi}(\Pi_3^0,1)+\Pi_3^0 c+d\right)^2>0$$

- `Add the following to the references`: Bloch, A.M., H. Flaschka, and T.S. Ratiu [1993] A Schur-Horn-Kostant convexity theorem for the diffeomorphism group of the annulus. *Inv. Math.* **113**, 511–529.