Symbol Index

This index lists symbols used frequently in the text, followed by the sections in which they first appear.

$\|\alpha\|$	Absolute value, 5.1.
A^*	Adjoint of the operator A, 3.7.
Ad A, Ad α	Adjoint rep operators, 5.1, 5.6.
B_α	Algebra of permutation operators, 4.3.
a, a^*	Annihilation and creation operators, 9.7.
$A(G)$	Automorphism group of G, 1.3.
$\mathcal{J}^+, \mathcal{J}^-, \mathcal{J}^3$ or J^+, J^-, J^3	Basis for a rep of $sl(2)$, 5.10.
$\mathfrak{L}_1, \mathfrak{L}_2, \mathfrak{L}_3$	Basis for $so(3)$, 7.1.
$J_n(z) = [(z/2)^n/n!] \sum_{k=0}^{\infty} [(-z^2/4)^k/(n+1)_k k!], n = 0, 1, \ldots,$	Bessel function, 10.2.
A_α	Bisymmetric transformations, set of, 4.3.
$\mathcal{E}_{kl}, \mathcal{E}_\alpha$	Branch, 9.1.
$\Gamma_n, \Gamma_n{}^m$	Bravais lattices, 2.8.
h_m	Cartan subalgebra of a classical group, 9.1.
$\chi(g), g \in G$	Character of the group G, 3.4.
$C_\infty, U(1), SO(2)$	Circle group, 2.3.
CG	Clebsch–Gordan, 3.5.
$(\mu i, \nu j \mid \xi s l)$	Clebsch–Gordan (CG) coefficients, 3.5.
$C(u, m; v, n \mid w, k)$	Clebsch–Gordan coefficients for $SU(2)$, 7.7.
α_j	Clifford algebra, elements of, 9.6.
$C(T)$	Column permutations of a Young tableau, 4.2.
$[A, B], [\alpha, \beta]$	Commutator bracket, 5.1, 5.3.
$\mathfrak{C}$	Complex numbers, 1.1.
$\bar{A} = (\bar{A}_{ij})$	Complex conjugate matrix, 3.1.
$\mathcal{C}_m{}^n$	Conjugacy class in a point group, 3.6.

$\mathbf{u} \times \mathbf{v}$	Cross product, 3.8.
C_n	Cyclic group of order n, 2.4.
$C_{\infty v}$, $C_{\infty h}$	Symmetry groups, 2.9, 7.6.
$\Delta(\epsilon_1, \ldots, \epsilon_m) = \prod_{j>k} (\epsilon_j - \epsilon_k)$, 9.2.	
$f'(x), \dot{f}(t)$	Derivative of a function, 5.1.
$\dot{A}(t)$	Derivative of a matrix-valued function, 5.1.
det A	Determinant of matrix A, 2.1.
$\lvert\epsilon^{l_1}, \ldots, \epsilon^{l_m}\rvert = \sum_{s \in S_m} \delta_s \epsilon^{l_1}_{s(1)} \cdots \epsilon^{l_m}_{s(m)}$, Determinant, 4.4, 9.2.	
D_n	Dihedral group, 2.4.
dim V	Dimension of vector space V, 3.2.
$G \times H$	Direct product of groups, 1.5.
$\mathbf{T}_1 \oplus \mathbf{T}_2$	Direct sum of reps $\mathbf{T}_1$ and $\mathbf{T}_2$, 3.2, 3.5.
$V \oplus W$	Direct sum of vector spaces V and W, 3.2, 3.5.
$D_{\infty h}$	Symmetry group, 2.9.
$\mathbf{T} \cong \mathbf{T}'$	Equivalence of reps, 3.1.
$E(n)$, $(E^+(n))$	Euclidean group in n-space (proper Euclidean group), 2.2.
$\{a, O\}$	Euclidean group element, 2.2.
(φ, θ, ψ)	Euler angles, 7.1.
exp α: $\mathfrak{G} \longrightarrow G$	Exponential mapping, 5.5, 5.9.
exp $A = e^A = \sum_{j=0}^{\infty} A^j/j!$	Exponential of a square matrix, 5.1.
G/N	Factor group, 1.2.
$\Gamma(z) = \lim_{n\to\infty} [n!\, n^z/(z)_{n+1}]$, $\Gamma(z+1) = z\Gamma(z)$, $\Gamma(n+1) = n!$, $n = 0, 1, 2, \ldots$,	Gamma function, 7.5.
$GL(n, \mathfrak{S})$, $GL(n, R)$, $GL(n)$	General linear groups, 1.1, 5.4.
G	Group, 1.1.
R_G	Group algebra (ring) of the group G, 3.1, 3.3.
$x = \sum_{g \in G} x(g) \cdot g$	Group algebra element, 3.1.
$\varphi(g, h)$	Group product in local Lie group, 5.2.
$T(g)$, $T(A)$	Group rep matrices, 3.1.
$\mathbf{T}(g)$, $\mathbf{T}(A)$	Group rep operators, 3.1.
$\mathbf{H}$	Hamiltonian operator, 3.8.
$H_n(x) = (-1)^n \exp(x^2)(d^n/dx^n) \exp(-x^2)$, $n = 0, 1, 2, \ldots$,	Hermite polynomials, 10.1.
$\mathfrak{H}$	Hilbert space, 3.8, Appendix.
μ: $G \longrightarrow G'$	Homomorphism of groups, 1.3.
τ: $\mathfrak{G} \longrightarrow \mathfrak{G}'$	Homomorphism of Lie algebras, 5.3.
${}_2F_1(a, b; c; z) = \sum_{n=0}^{\infty} [(a)_n (b)_n/(c)_n](z^n/n!)$, $\lvert z\rvert < 1$,	Hypergeometric series (see Pochhammer symbol), 7.2.
Y	Icosohedral group, 2.4.
$\mathfrak{I}$	Ideal, 4.3.
$\mathfrak{O}_\alpha$, $\mathfrak{R}_\alpha$	Ideals in the group ring of S_α, 4.3.
e	Identity element in a group, 1.1.
E_n	Identity matrix, $n \times n$, 2.1, 3.3.
$\mathbf{E}$	Identity operator, 2.1.
$\mathbf{T}^G$	Induced rep, 3.5.
$\langle \mathbf{u}, \mathbf{v} \rangle$, $(\mathbf{u}, \mathbf{v})$	Inner product, 2.1, Appendix.
$\int f(x)\, dx$	Integral of $f(x)$, 3.1, 3.8, Appendix.
$dA, d_lA, d_rA, \delta A$	Invariant measures on a linear Lie group, 6.1.
$\mathbf{I} = -\mathbf{E}$	Inversion operator, 2.3.
Irred	Irreducible (representation), 3.2.
$\mathbf{T}^{(\mu)}$	Irred rep of group G, indexed by the integer μ, 3.3.

$[f_1, \ldots, f_m]$ Irred reps of $GL(m)$, $U(m)$, and $SL(m)$, 9.1.
$\mathbf{D}^{(u,v)}$ Irred rep of proper homogeneous Lorentz group, 8.3.
$\mathbf{D}_+^{(u,v)}, \mathbf{D}_-^{(u,v)}$ Irred reps of $L^\uparrow$, 8.3.
$\mathbf{D}_+^{(l)}, \mathbf{D}_-^{(l)}$ Irred reps of $O(3)$, 7.6.
$\mathbf{D}^{(u)}$ Irred reps of $SU(2)$, $SO(3, R)$, and $SL(2, \mathfrak{C})$, 7.2, 7.3.
$G \cong H$ Isomorphism of groups, 1.1, 2.4.
G^x Isotropy subgroup of G at x, 1.4.
$\delta_{ij} = 1$ if $i = j$, $= 0$ if $i \neq j$; Kronecker delta, 1.1.
$L_n^{(\alpha)}(z) = [\Gamma(\alpha + n + 1)/\Gamma(\alpha + 1)n!] \sum_{j=0}^{\infty} [(-n)_j/(\alpha + 1)_j](z^j/j!)$, $n = 0, 1, 2, \ldots$, Laguerre polynomial, generalized, 7.5, 10.2.
Δ Laplacian, 3.1.
$L_2(G)$ Lebesgue square-integrable functions on the group G, 6.2, Appendix.
$L_2(\mathfrak{M})$ Lebesgue square-integrable functions on domain $\mathfrak{M}$, Appendix.
$\mathbf{L}(g)$ Left regular rep, 1.4, 3.1.
$P_u^m(\cos\theta) = P_u^{0,-m}(\cos\theta)$, Legendre function (associated), 7.2.
$P_n(\cos\theta) = {}_2F_1(n + 1, -n; 1; \frac{1}{2}(1 - \cos\theta))$, $n = 0, 1, 2, \ldots$, Legendre polynomial, 7.2.
$\mathfrak{G}$ Lie algebra, 5.3.
$L(G)$ Lie algebra of local Lie group G, 5.3.
$so(3, 1)$ Lie algebra of homogeneous Lorentz group, 8.1, 9.10.
L_α, D_α Lie derivatives, 5.9.
$\mathbf{T}: V \longrightarrow V$ Linear transformation, 2.1, 3.1.
$\ln A$ Logarithm of a matrix, 5.1.
$L^\uparrow$ Lorentz group (complete), 8.3.
$L(4)$ Lorentz group (homogeneous), 8.1.
$L^{\uparrow +}$ Lorentz group (proper), 8.1.
$T = (T_{ij})$ Matrix, 2.1.
${}^{2S+1}L_J$ Multiplet, 9.8.
$\nu(\mathbf{x}, g)$ Multiplier, 5.9.
$\|\mathbf{u}\|, \|\mathbf{A}\|$ Norm of a vector (operator), 2.1, 5.1, Appendix.
$N_{\mathbf{A}}$ Null space of linear operator $\mathbf{A}$, 3.3.
O Octahedral group, 2.4.
$n(G)$ Order of group G, 1.1.
$W^\perp$ Orthogonal complement of subspace W, 3.2.
$O(n, \mathfrak{C}), O(n, R), O(n)$ Orthogonal groups, 5.4.
$\{\lambda_j\} \boxtimes \{\mu_k\}$ Outer product of irred reps of S_n and S_m, 9.9.
δ_s Parity of the permutation s, 4.1, 9.2.
$\partial f/\partial x, \partial_x f, f_x$ Partial derivative, 3.1.
$\partial_{\pm 1/2, \pm 1/2}$ Partial derivatives, 8.4.
$\{f_1, \ldots, f_n\}$ Partition or frame, 4.1.
$\begin{pmatrix} 1 & 2 & \cdots & n \\ p_1 & p_2 & \cdots & p_n \end{pmatrix}$, $(p_i \cdots p_j)$, $\boldsymbol{\sigma}(x)$, Permutations, 1.1, 4.1.
$\perp$ Perpendicular, 2.8.
$h = 2\pi\hbar \sim 1.054 \times 10^{-27}$ erg sec, Planck's constant, 3.1, 3.8.
$(a)_n = a(a + 1) \cdots (a + n - 1) = \Gamma(a + n)/\Gamma(a)$, Pochhammer's symbol (see Bessel, hypergeometric, and Laguerre functions).
P Poincaré group, 8.2.
$\mathcal{P}$ Poincaré group (covering group of), 8.4.
$C_{nh}, C_{nv}, D_{nh}, D_{nd}$, $O_h = O \cup \mathbf{I}O, S_{2n}, T_d$, $T_h = T \cup \mathbf{I}T, Y_h = Y \cup \mathbf{I}Y$, Point groups, 2.5.

$\mathbf{P}$	Projection operator, 3.3, 3.7.
$R_{\mathbf{A}}$	Range of linear operator $\mathbf{A}$, 3.3.
R_n	Real Euclidean n-space or group ring of S_n, 2.1, 4.2.
R	Real numbers, 1.1.
$\sigma_{\mathbf{k}}$	Reflection in plane perpendicular to $\mathbf{k}$, 2.1.
Rep	Representation, 3.1.
$\mathbf{T}\|W$	Restriction of $\mathbf{T}$ to W, 3.2, 3.5.
$\mathbf{R}(g)$	Right regular rep, 3.1.
$\alpha(\mathcal{H})$	Root form, 9.1.
$C_{\mathbf{k}}(\theta)$	Rotation through angle θ about axis $\mathbf{k}$, 2.1.
$S_{\mathbf{k}}(\theta) = \sigma_{\mathbf{k}} C_{\mathbf{k}}(\theta)$,	Rotation-inversion, 2.1.
$R(T)$	Row permutations of a Young tableau, 4.2.
Spin(m)	Simply connected covering group of $SO(m, \mathfrak{C})$, 9.6.
$SL(n, \mathfrak{C}), SL(n, R), SL(n)$ $[sl(n, \mathfrak{C}), sl(n, R), sl(n)]$,	Special linear groups (Lie algebras), 1.1, 5.4.
$SO(n, \mathfrak{C}), SO(n, R), SO(n)$ $[so(n, \mathfrak{C}), so(n, R), so(n)]$,	Special orthogonal groups (Lie algebras), 1.4.
$SU(m)$ $[so(m)]$	Special unitary group (Lie algebra), 5.4.
$Y_l^m(\theta, \varphi) = [(2l+1)(l-m)!/4\pi(l+m)!]^{1/2} P_l^m(\cos\theta) e^{im\varphi}$, $m = -l, -l+1, \ldots, l$, $l = 0, 1, 2, \ldots$,	Spherical harmonic, 7.4.
$P_u^{-m,n}(\cos\theta) = [(\sin\theta)^{m-n}(1+\cos\theta)^{u+n-m}/2^u\Gamma(m-n+1)]_2F_1(-u-n, m-u;$ $m-n+1; [(\cos\theta-1)/(\cos\theta+1)])$,	Spherical function (generalized), 7.2.
S_n, S_α	Symmetric group, 1.1, 4.4.
S_X	Symmetric group on set X, 1.4.
$Sp(m)$	Symplectic group, 5.4, 9.4.
$a_{j_1 \cdots j_n}$	Tensor components, 3.8.
$\mathbf{T}_1 \otimes \mathbf{T}_2$ ($\mathbf{T}^{\otimes n}$)	Tensor product of group reps (n-fold), 3.5 (3.8).
$\mathbf{u} \otimes \mathbf{v}$	Tensor product of vectors, 3.5.
$V \otimes W$ ($V^{\otimes n}$)	Tensor product of vector spaces (n-fold), 3.5 (3.8).
^{2S+1}L	Term, 9.8.
T	Tetrahedral group, 2.4.
$\begin{pmatrix} j_1 & j_2 & j_3 \\ m_1 & m_2 & m_3 \end{pmatrix}$	3-j coefficients, 7.7.
$\operatorname{tr} A = \sum_{i=1}^n A_{ii}$	Trace of $n \times n$ matrix A, 2.1.
$\mathbf{T}_{\mathbf{a}}$	Translation, 2.2.
$T(n)$	Translation group in n-space, 2.2.
A^{t}	Transpose of matrix A, 2.1.
$U(m), USp(2m), SU(m)$	Unitary classical groups, 5.4, 9.4.
$\mathbf{u}, \mathbf{v}, \mathbf{x}$	Vectors, 2.1, 3.1.
V, W	Vector spaces, 3.1.
V_G	Volume of compact group G, 6.2.
$V(Q)$	Volume of parallelepiped Q, 2.6.
$\Lambda(\mathcal{H})$	Weight, 9.1.
$S^\alpha\Lambda = \Lambda - 2(\Lambda_\alpha/\alpha_\alpha)\alpha$	Weyl reflection, 9.1.
Z	Zero matrix, 3.7.
$\mathbf{Z}$	Zero operator ($\mathbf{Zv} = \boldsymbol{\theta}$), 3.7.
$\boldsymbol{\theta}$	Zero vector, 2.2.