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Angular momentum in quantum physics: *Theory and application*, by L. C. Biedenharn and J. D. Louck, Encyclopedia of Mathematics and its Applications, Vol. 8, Addison-Wesley Publishing Company, Reading, Mass., xxix + 716 pp., $54.50. ISBN 0-2011-3507-8

The Racah-Wigner algebra in quantum theory, by L. C. Biedenharn and J. D. Louck, Encyclopedia of Mathematics and its Applications, Vol. 9, Addison-Wesley Publishing Company, Reading, Mass., lxxxviii + 534 pp., $54.50 ISBN 0-2011-3508-6

Angular momentum is a physical quantity which appeared first in classical mechanics. Consider indeed the simplest case of a particle moving in $\mathbf{R}^3$. The observables of this physical system are (C^∞–) functions from $T^*\mathbf{R}^3 \simeq \mathbf{R}^6 \equiv \{(x, p) \mid x, p \in \mathbf{R}^3\}$. The Poisson bracket $\{\cdot,\cdot\}$ associates to every pair (f, g) of such functions the function $\{f, g\}$ defined by

$$\{f, g\} \equiv \sum_{k=1}^{3} \left(\partial_{x^k} f \cdot \partial_{p^k} g - \partial_{x^k} g \cdot \partial_{p^k} f\right). \tag{1}$$

Notice, in particular, that for all $k, l = 1, 2, 3$,

$$\{x^k, x^l\} = 0 = \{p^k, p^l\}; \ \{x^k, p^l\} = \delta^{kl} 1. \tag{2}$$

Then the angular momentum $L \equiv x \times p$ is the triple (L^1, L^2, L^3) of functions

$$L^j(x, p) \equiv x^k p^l - x^l p^k, \tag{3}$$

where (j, k, l) is any triple of indices obtained from $(1, 2, 3)$ by cyclic permutations. The Poisson brackets between the components of the angular momentum are

$$\{L^j, L^k\} = L^l, \tag{4}$$

where again (j, k, l) are cyclic permutations of $(1, 2, 3)$.

The angular momentum appeared in the quantum mechanical description of a particle, moving similarly in $\mathbf{R}^3$, as the triple $L = (L^1, L^2, L^3)$ of operators,