Geometric Phases in Classical and Quantum Mechanics. Dariusz Chruscinski and Andrzej Jamiolkowski. Birkhauser Boston, c/o Springer Verlag, New York, 175 5th Avenue, New York 110 010, USA. 333 pp.

Phase Geometrica is stranger than fiction
Born of Wavefunctiona in parallel transportation
Her heredity just could not be weirder
None can tell which Hamiltonian sired her
For Centuries, Phase Geometrica remained unseen
Till Pancharatnam encountered and nailed her gene
And since Berry spotted her in Adiabati city
We have all savoured her elegance and beauty

Over two decades ago, Michael Berry discovered that when a Hamiltonian is cycled adiabatically, its eigenstate acquires, in addition to the familiar dynamical phase, a phase that depends only on the geometry of evolution. Thanks to 'a referee's delay and an accident of astronomy', however, this pioneering work could only appear in print (Berry 1984) well after a letter (Simon 1983) elucidating 'Berry's phase' in terms of the anholonomy in a Hermitian line bundle. Berry's paper (1984) triggered an intense activity in this field. Geometric phase, the phase anholonomy of a parallel transported wavefunction, depends only on the geometry of the curve traced in the ray space and is nonintegrable and Hamiltonian-independent. Two centuries earlier, Gauss was aware of the angle anholonomy of a vector parallel transported on a curved surface. In 1851, the Foucault pendulum manifested this angle anholonomy to demonstrate the earth's rotation. The parallel transport law for the polarization vector of an electromagnetic wave traversing an inhomogeneous refractive medium, was derived in the early twentieth century (Bortolotti (1926), Rytov (1938), Vladimirskii (1941)). But Pancharatnam (1956), studying phases between distinct polarization states of light, was the first to explicitly recognize geometric phase by arriving at the 'unexpected geometrical result' in a geodesic triangle on the Poincaré sphere. Ironically, Pancharatnam's geometric phase arose in the most general, viz. nonadiabatic, noncyclic and nonunitary, scenario. Geometric phase has since encompassed a vast spectrum of scientific disciplines. Dariusz Chruscinski and Andrzej Jamiolkowski of Nicholas Copernicus University in Poland have now come up with a graduate textbook on *Geometric Phases in Classical and Quantum Mechanics*, volume 36 in the Progress in Mathematical Physics series.

After creating the requisite mathematical base with a short introduction to differential geometric concepts of Lie groups, fibre bundles and topology, the book reviews the quantum adiabatic theorem and presents Berry's seminal geometric correction to it. The non-Abelian geometric phase for a degenerate system and the fibre bundle approach to geometric phase are briefly touched upon. The angle anholonomy for a classical system undergoing a cyclic evolution is dealt with and its relation with the quantal geometric phase is established. Nonadiabatic, noncyclic and nonunitary generalizations of the adiabatic geometric phase, culminating into the Pancharatnam connection, are introduced. The final chapter surveys geometric phases in optics and molecular physics, topological phases, the quantum Hall effect and the spin-statistics theorem. The book concludes by outlining holonomic quantum computation.

The book forms a compact, yet comprehensive, introduction to the mathematical physics of this young field in its twenties. Its large bibliography should serve as a quick reference to the relevant literature. Mathematical appendices have been thoughtfully provided for students. Suggested references for further reading and illustrative exercises listed at the end of each chapter are useful to gain a better understanding of the respective topic.

The book has some scope, though, for improvement. A more detailed description of the observational aspect of geometric phase and the underlying physics would substantiate the mathematical derivations. Including a discussion on quantum beats arising from a time-proportional geometric phase (*Phys. Rev. A*, 1986, **34**, 2600 and *Phys. Rev. Lett.*, 1988, **61**, 19), geometric phase in a nonunitary evolution (*Phys. Rev. Lett.*, 1988, **60**, 1211), separation of geometric and dynamical phases (*Phys. Rev. Lett.*, 1997, **78**, 755), interference amplitudes and phases in a noncyclic evolution (*Phys. Rev. Lett.*, 1999, **83**, 2090) and origin of geometric phase from the commutator between successive density operators along the ray space curve (*J. Phys. A: Math. Gen.*, 1999, **32**, 5167), for instance, would enrich the student reader's perspective on geometric phase. A geometric depiction of the Pancharatnam triangle phase on the two-sphere would have elegantly brought the concept home to the young reader. It would also have eliminated the error on p. 214 in the cited value of $\langle\psi_1|\psi_3\rangle$. Typographical errors strewn all over the book may mislead the reader, considering that the book is meant primarily for students. To cite just a few, the sphere normal **r** is replaced with its derivative in the last term of RHS in eq. (2.150) and vice versa in the last term of RHS (2nd line) in eq. (2.151). The order of **r** and its derivative in the first term of RHS (3rd line) in eq. (2.151) stands reversed (p. 97). Likewise, the minus sign is missing from the assumed value of the 'giromagnetic' ratio on p. 200 as well as eq. (5.106) on p. 201.

All in all, this is a good textbook ushering the graduate student through the wonderland of geometric phase and whetting up the appetite for further exploration.

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Annual Review of Biochemistry 2004. Charles C. Richardson (ed.). Annual Reviews Inc., 4139 El Camino Way. P. O. Box 10139, Palo Alto, California 94303-0139, USA. Vol. 73. 1232 pp.

Biochemistry, as it may sound, does not merely deal with the chemistry of biological systems. Its highly interfacial nature generates a myriad of research areas both *in vitro* and *in vivo*, all aimed at understanding the science of biological molecules. And, it is this multitude of research areas in unison that generates the excitement of discovery. The volume under review begins with the recollections of Alex Rich that illustrate the model of a biochemist who feels the excitement of discovery.

DNA damage has been known to activate several distinct biochemical pathways. When damaged, not only are the repair mechanism and the DNA damage checkpoints activated, but the transcription of certain other genes are also triggered (transcriptional response). The repair and checkpoint activation play a positive role toward cell survival, but what role the transcriptional response plays is not known. Another little known aspect is how the cell chooses to