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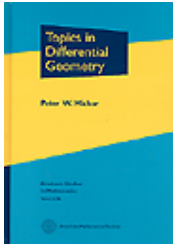
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MAA Reviews

Topics in Differential Geometry

Peter W. Michor

Publisher: American Mathematical Society (2008)
Details: 494 pages, Hardcover
Series: Graduate Studies in Mathematics 93
Price: $75.00
ISBN: 9780821820032
Category: Textbook
Topics: Differential Geometry, Invariant Theory, Lie Groups and Algebras, Manifolds, Riemannian Geometry

[Reviewed by Michael Berg, on 09/04/2008]

In less than two pages (pp. 54–55) the Campbell-Baker-Hausdorff formula is taken care of, in a proof containing exactly forty-eight English words: the rest is algebraic manipulation. For some of us, myself included, this is an exposition devoutly-to-be-wished; for the complementary set of readers it's something a lot less than palatable. So, given that Peter W. Michor's *Topics in Differential Geometry* generally evinces such a style, a *caveat* is in order: one reads the book prepared to follow many a development carefully computing alongside the author. This is not to say that the book is void of exposition and discussion; on the contrary, it is very well written and all the required prose is there. But Michor doesn't mince words and the book takes off quickly, climbs to a good altitude right away, and stays there. As I already indicated, however, I like this style very much and find the book remarkably effective.

Thus, with Campbell-Baker-Hausdorff making its appearance only some fifty pages into a book on differential geometry it's clear as vodka (what's the movie? — see below) that the basics are developed swiftly and that Lie theory is given a lot of early airplay. Indeed, manifolds vector fields take up only the first forty pages or so of *Topics in Differential Geometry*, followed by some sixty pages on Lie groups and group actions. After that it's de Rham cohomology, fiber bundles, connections, and characteristic classes, and then Riemannian geometry. And for dessert, the reader is presented with symplectic and Poisson geometry.

For the serious student, willing to work and possessed of a decent amount of maturity (in the mathematical sense — whatever this means), Michor's book is a truly marvelous pick from which to learn a lot of beautiful, important, and current mathematics. The absence of exercises is effectively remedied by the aforementioned imperative that the reader should be willing to work along carefully with what Michor is doing, specifically *qua* "calculations"; and beyond this the sheer elegance of the material should easily spell-bind the reader, to boot. *Topics in Differential Geometry* is a fine book.

Answer to the parenthetical question: It's from "Real Genius," starring Val Kilmer.

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