Journal of Lie Theory
Volume **7** (1996) 61–99
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Regular infinite dimensional Lie groups

Andreas Kriegl and Peter W. Michor

Communicated by Editor W. A. F. Ruppert

Abstract. Regular Lie groups are infinite dimensional Lie groups with the property that smooth curves in the Lie algebra integrate to smooth curves in the group in a smooth way (an 'evolution operator' exists). Up to now all known smooth Lie groups are regular. We show in this paper that regular Lie groups allow us to push surprisingly far the geometry of principal bundles: parallel transport exists and flat connections integrate to horizontal foliations as in finite dimensions. As consequences we obtain that Lie algebra homomorphisms intergrate to Lie group homomorphisms, if the source group is simply connected and the image group is regular.
Keywords and phrases: Regular Lie groups, infinite dimensional Lie groups, diffeomorphism groups
1991 Mathematics Subject Classification: 22E65, 58B25, 53C05

Institut für Mathematik
Universität Wien
Strudlhofgasse 4
A-1090 Wien
Austria
kriegl@pap.univie.ac.at

Erwin Schrödinger Institut für Mathematische Physik
Pasteurgasse 6/7
A-1090 Wien
Austria
Peter.Michor@esi.ac.at

Received November 11, 1996

ISSN 0949–5932 / $2.50 © Heldermann Verlag