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	authors	• Schreiber, Urs • Waldorf, Konrad	**authors**	• Urs Schreiber • Konrad Waldorf	DUPLICATES	14
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	id	id4706313761081076190	**id**	id858799148035343374		
	abstract	We introduce an axiomatic framework for the parallel transport of connections on gerbes. It incorporates parallel transport along curves and along surfaces, and is formulated in terms of gluing axioms and smoothness conditions. The smoothness conditions are imposed with respect to a strict Lie 2-group, which plays the role of a band, or structure 2-group. Upon choosing certain examples of Lie 2-groups, our axiomatic framework reproduces in a systematical way several known concepts of gerbes with connection: non-abelian differential cocycles, Breen-Messing gerbes, abelian and non-abelian bundle gerbes. These relationships convey a well-defined notion of surface holonomy from our axiomatic framework to each of these concrete models. Till now, holonomy was only known for abelian gerbes; our approach reproduces that known concept and extends it to non-abelian gerbes. Several new features of surface holonomy are exposed under its extension to non-abelian gerbes; for example, it carries an action of the mapping class group of the surface.Comment: 57 pages. v1 is preliminary. v2 is completely rewritten, former Sections 1 and 2 have been moved into a separate paper (arxiv:1303.4663), and the discussion of non-abelian surface holonomy has been improved and extended. v3 is the final and published version with a few minor correction	**abstract**	We introduce an axiomatic framework for the parallel transport of connections on gerbes. It incorporates parallel transport along curves and along surfaces, and is formulated in terms of gluing axioms and smoothness conditions. The smoothness conditions are imposed with respect to a strict Lie 2-group, which plays the role of a band, or structure 2-group. Upon choosing certain examples of Lie 2-groups, our axiomatic framework reproduces in a systematical way several known concepts of gerbes with connection: non-abelian differential cocycles, Breen-Messing gerbes, abelian and non-abelian bundle gerbes. These relationships convey a well-defined notion of surface holonomy from our axiomatic framework to each of these concrete models. Till now, holonomy was only known for abelian gerbes; our approach reproduces that known concept and extends it to non-abelian gerbes. Several new features of surface holonomy are exposed under its extension to non-abelian gerbes; for example, it carries an action of the mapping class group of the surface.		
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