

This is a review submitted to Mathematical Reviews/MathSciNet.

Reviewer Name: Street, R. H.

Mathematical Reviews/MathSciNet Reviewer Number: 6231

Address:

Department of Mathematics
Macquarie University
Sydney NSW 2109
AUSTRALIA
ross.street@mq.edu.au

Author: Baez, John C.; Baratin, Aristide; Freidel, Laurent; Wise, Derek K.

Title: Infinite-dimensional representations of 2-groups.

MR Number: MR2978538

Primary classification: 18D05

Secondary classification(s): 20C35

Review text:

A 2-groupoid is a 2-category in which all morphisms and 2-cells are invertible. A 2-group G is a 2-groupoid with a single object. Write $\mathbf{2-Rep}(G, C)$ for the 2-category whose objects are 2-functors (called representations), whose morphisms are pseudo-natural transformations (called intertwiners), and whose 2-cells are modifications (called 2-intertwiners). This memoir studies $\mathbf{2-Rep}(G, C)$ for a particular choice \mathbf{Meas} of the 2-category C . It is argued that taking $C = \mathbf{2-Vect}$ in the sense of [M.M. Kapranov and V.A. Voevodsky, “2-categories and Zamolodchikov tetrahedra equations”, Proc. Sympos. Pure Math., 56, Part 2, (Amer. Math. Soc., Providence, RI, 1994) 177–259; MR1278735] gives too few representations. So they take a particular sub-2-category \mathbf{Meas} of the 2-category of C^* -categories, C^* -functors and C^* -natural transformations in the sense of [P. Ghez, R. Lima, and J.E. Roberts, “ W^* -categories”, Pacific J. Math. 120 (1985) 79–109; MR0808930 (87g:46091)]. The objects of \mathbf{Meas} are the measurable categories H^X based on suitable measure spaces X , which evolved in the series of papers [L. Crane and M.D. Sheppeard, “2-Categorical Poincaré representations and state sum applications”, [arXiv:math/0306440](https://arxiv.org/abs/math/0306440)], [D.N. Yetter, “Measurable categories”, Appl. Categ. Structures 13 (2005) 469–500; MR2198813], [L. Crane and D. Yetter, “Measurable categories and 2-groups”, Appl. Categ. Structures 13 (2005) 501–516; MR2198814]. Measurable fields of Hilbert spaces occur in the work of G.W. Mackey [“Induced Representations of Groups and Quantum Mechanics”, (Benjamin, New York, 1968; MR0507212 (58:22373)] since Lie groups have many actions on measurable spaces (which leads to the abundance of Lie 2-group representations on

measurable categories). The objects of H^X are measurable fields of Hilbert spaces varying over X . The heart of this well-written memoir is Chapter 4 which explains the structure of the ingredients of $\mathbf{2-Rep}(G, \mathbf{Meas})$, looks at direct sums and tensor products, and discusses reducibility and decomposability notions.