### Monday, May 19, 2025 from 4:45 p.m. to 6:20 p.m. (Moscow time) ZOOM ONLY

## Vladimir S. Matveev

# Bernhard Riemann 1861 revisited: existence of flat coordinates for an arbitrary bilinear form

I generalize the celebrated foundational results of Bernhard Riemann and Gaston Darboux: we give necessary and sufficient conditions for a bilinear form to be flat. More precisely, I give explicit necessary and sufficient conditions for a tensor field of type (0, 2) which is not necessarily symmetric or skewsymmetric, and is possibly degenerate, to have constant entries in a local coordinate system. This portion of results is based on [1] and [2].

Special attention will be devoted to the question of how smooth are the "flat" coordinate system. In particular I overview known results on the smoothness of isometries of Riemannian metrics, and generalize them to the Finslerian metrics. This portion of results is based on [3].

[1] Bandyopadhyay, S., Dacorogna, B., Matveev, V.S., Troyanov, M., Bernhard Riemann 1861 revisited: existence of flat coordinates for an arbitrary bilinear form, Math. Zeit. 305:1 (2023), 12.

[2] Bandyopadhyay, S., Dacorogna, B., Matveev, V.S., Troyanov, M., On the equation  $(Du)^t HDu = G$ , Nonlinear Analysis 214 (2022), 112555.

[3] Matveev, V.S., Troyanov, M., The Myers-Steenrod theorem for Finsler manifolds of low regularity, Proc. Amer. Math. Soc., 145:6 (2017), 2699–2712.

### SCIENTIFIC SEMINAR "DIFFERENTIAL GEOMETRY AND APPLICATIONS"

#### headed by Academician of RAS Anatoly T. Fomenko

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