

Did Lobachevsky have a Model of his “Imaginary Geometry”?

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The invention of non-Euclidean geometries is often seen through the optics of Hilbertian formal axiomatic method developed later in the 19th century. However such an anachronistic view on Lobachevsky’s mathematical works fails to provide a sound understanding of his motivations and research strategies. Unlike what the name of “imaginary geometry” may suggest, Lobachevsky’s major motivation behind his geometrical achievements was to develop geometry on empirically relevant (rather than abstract and idealised) mathematical concepts and thus make it better applicable in natural sciences.

The modern notion of model of a given theory has a counterpart in Lobachevsky’s writings but its role in Lobachevsky’s geometrical theory turns to be very unusual. Lobachevsky doesn’t consider various models of Hyperbolic geometry, as today normally does any student of this theory, but builds instead a non-standard model of Euclidean plane as a particular surface in the hyperbolic 3-space, and on this basis develops an analytic calculus known today under the name of hyperbolic trigonometry.

In my presentation I shall survey this Lobachevsky’s construction, and argue that Lobachevsky’s empirically-oriented thinking about geometry and mathematics in general remains relevant and valuable in the context of today’s science and mathematics.