

ON THE UNSYMMETRIC TOP

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This paper is in the nature of a sequel to that published by the author in the *Acta mathematica* for August 1932, Vol. 59, page 423. In that paper the center of gravity was taken on one of the principal axes of the momental ellipsoid of the body corresponding to the fixed point. The kinetic energy and the angular momentum were assumed to be quadratic functions of ω_3 , the projection of the angular velocity vector on the principal axis on which the center of gravity lies. This assumption led to the two cases given in that paper. The purpose of the paper is to find all similar cases¹ in which the kinetic energy and the angular momentum squared are expressible as polynomials in ω_3 . It upholds the best traditions of workers on the top problem by giving one new case, but to the authors mind the most interesting part of the paper is its limiting character. It will be shown that there are no more cases of this particular type.

The equations of motion for the top with its center of gravity on the z -axis are:

$$(1) \quad I_1 \dot{\omega}_1 + (I_3 - I_2) \omega_2 \omega_3 = Wh \sin \Theta \cos \Phi$$

$$(2) \quad I_2 \dot{\omega}_2 + (I_1 - I_3) \omega_1 \omega_3 = - Wh \sin \Theta \sin \Phi$$

$$(3) \quad I_3 \dot{\omega}_3 + (I_2 - I_1) \omega_1 \omega_2 = 0.$$

¹ N. Kowalevski: *Math. Annalen* 65, p. 528, 1908, tried to find all possible cases for which ω_1^2 and ω_2^2 can be expressed as polynomials of the third degree in ω_3 . He found one new case, reference to which is made farther on in this paper.