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Existence of potential for linearized Weyl tensor as a generalized Poincare lemma

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Linearized gravity could be treated as a linear theory of a field having symmetries of the Weyl tensor (spin-2 field). To obtain linearized gravity equations in this formulation from a variational formula, it is necessary to have a guarantee of the existence of potential for every spin-2 field. This problem is known as an existence of Lanczos potential, which has been fully solved by F. Bampi and G. Caviglia in 1983. I will show that behind this problem lies the elegant mathematical structure of the N-complex of traceless tensor fields of given Young symmetry (which is a generalization of the de Rham complex of differential forms). The main result presented in the talk will be the fact that existence of potential for spin-2 field is a strict consequence of the generalized Poincare lemma for some N-complex of tensor fields, analogically to classical electrodynamics.

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