

# *Einstein's Connections*

## *II. Nondegenerate Case*

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**Summary.** In a recent paper [3], I gave the solution of EINSTEIN's first set of equations of unified field theory by the method of repeated substitution for the third and fourth classes and for the special case of the first class when  $D = 0$ . These solutions hold for any index of inertia for which the particular class exists. The object of this paper is to obtain the solutions for the first and second classes for all indices of inertia, by the method of repeated substitution, and to show that the general solution for the first class yields the solution for other classes. It has already been shown that Mme. TONNELAT's solution [4] holds only for the first class. HLAVATÝ's solution for the first class holds also for the second class, but not for the third class for which he found another form of solution. An open question (HLAVATÝ [1], p. 99), regarding the conditions that the form of the solution for the third class is also the form of the solution for other classes, is also solved.

**1. Introduction.** EINSTEIN's unified field theory is based on three principles (HLAVATÝ [1], pp. X, XI):

(a) The basic real tensor  $g_{\lambda\mu}$  is non-symmetric and may be split into its symmetric part  $h_{\lambda\mu}$  and its skew-symmetric part  $k_{\lambda\mu}$  :

$$(1.1) \quad g_{\lambda\mu} = h_{\lambda\mu} + k_{\lambda\mu} .$$

The tensor  $h_{\lambda\mu}$  is assumed to be of rank 4. It is said to be of index of inertia 0, 2 or 4 according as the signature of  $h_{\lambda\mu}$  is  $(+ + - -)$ ,  $(+ + + -)$  or  $(+ + + +)$ .\*

(b) The basic connection  $\Gamma_{\lambda\mu}^{\nu}$  is given by

$$(1.2) \quad D_{\omega} g_{\lambda\mu} = 2S_{\omega\mu}^{\alpha} g_{\lambda\alpha} ,$$

where  $D_{\sigma}$  is the symbolic vector of the covariant derivative with respect to

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\*This includes the equivalent combinations of  $+$  and  $-$  signs also.