

Andrzej Zajtz

## On the algebraic operations on the geometric objects

In the present paper we give some remarks on the algebra of geometric objects and we define the notion of Kronecker multiplication of linear homogeneous objects. Theoretically, the problem of algebra is not much considered; only for some special classes of objects as, for instance, for tensors or densites. This problem has been dealt with by J. Aczél, M. Hossú, S. Gołąb and M. Kucharzewski — M. Kuczma (the complete references are given in [4]).

1. Under  $q$ -nary operation on the objects  $(\Omega_i)$ ,  $i = 1, \dots, q \geq 2$  is understood ([1], p. 92) any system of functions

$$(1) \quad f_j(\Omega_1, \dots, \Omega_q), \quad j = 1, \dots, m$$

such that the values of these functions are the components of an geometric object. This object—the result of the operation (1), can be considered as an algebraic concomitant of the objects  $(\Omega_i)$  or, what means the same, as a concomitant of one object

$$(2) \quad \Omega = (\Omega_1, \dots, \Omega_q)$$

— the union of these objects ([1], p. 13). Thus the problem of finding all the operations (1) (that is all the algebras for the objects  $(\Omega_i)$ ) reduces to the problem of determining all the algebraic concomitants of the object (2). Basing on this fact we shall give now some other (more algebraic) formula for the above definition.

Let  $F$  denote a family of homologueous geometric objects, i.e. of the objects, which are defined in the same point of a manifold and related to the same group of local transformations. An operation on  $F$  will be called a composition law, according to which to some ordered subsets of  $F$  there corresponds exactly one geometric object and this correspondence is independent of the choice of the coordinate system. (That means that any operation on  $F$  allows to build from the objects of  $F$  some new objects—concomitants of theirs.) An algebra will be called a system of  $F$  and some number on  $F$  defined ope-

