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How to make places and times with events.

Difficulties with location of events in space and time are well known. Take the killing of Caesar as an example. It happened in Rome in 44 BC. More precisely - in the Senate House at Rome on March 15, 44 BC. Hour and the room of the Senate House may be also added. Thus we speak about more and less precise locations of events in a similar way we speak about more and less precise locations of objects. There is an important difference between the two cases however. Besides an object's more or less precise approximate locations we have the idea of what is its *exact* location in space and time, that is a set of space coordinates $(X_A(t), Y_A(t), Z_A(t))$ of every object's point A at every moment of time t when object exists (within some frame of reference). Alternatively any object may be located point-by-point in space-time. Although only objects' approximate locations matter practically it is the idea of exact location that provides a theoretical account of what is spatio-temporal location of object as such.

The problem is that we have no clear idea of what is exact spatio-temporal location of event. Which momentary state of affairs marks the exact beginning and which marks the exact end of the killing of Caesar? How to draw a boundary between the space region(s) occupied and the space region(s) not occupied with the event? Or how to draw such a boundary in space-time? Any possible answer seems to be arbitrary and purely conventional.

Moreover there is reason to say that no event may be located point-by-point in space and time or in space-time at all. The reason is this. An object may be located point-by-point since in the simplest case it may be located at *single* point of space and in single moment of time (at single point of space-time). Such an idealized object is *material point*; although no object may exist only a single moment, all times of its existence but single moment may be excluded from consideration; thus «a material point A which in moment of time t has (X, Y, Z) space coordinates» is a primitive account on object's location. Considering an extended object as an aggregate of its material points they locate it point-

by-point. However no event may be similarly idealized into «point event». For since 1) any event involves some movement in space (physically if not phenomenologically) and 2) any movement in space takes more than one moment of time and more than one point in space (i.e. it occupies more than one point in space-time) then no point event is possible even purely theoretically. Since there are no point events no event may be located exactly point-by-point similarly as objects are located.

There are three options then: 1) there are no events; 2) events exist but are not located in space and time; 3) events exist and are located in space and time but not point-by-point. Among these options the second is obviously wrong. The first option makes an ontological challenge that may not be met here. The third is plausible. My goal is to develop a radical variant of the third option: events are located in time without moments and in space without points.

Firstly I develop the idea mathematically constructing «pointless continuum». Take an infinite line as the simplest example. Let it be divided into segments. It seems that it cannot be done but with points which are boundaries between every two adjacent segments. To switch this intuition consider the dual configuration changing points for segments and otherwise. Then say that every segment is a boundary between two points which are its ends. Neglecting difference between segments and points suppose that line's parts are elements of the same nature which bound each other. Suitable axiomatic theory of how these elements (which I call events for the reason of interpretation) behave to make a linear continuum is built. It presents a linear continuum as a (McLane's) category without introducing any indivisible elements, i.e. points. Then the theory is generalized to exclude the condition that pointless continuum is linear.

The construction of pointless continuum allows to make an account of events' location relational. Events are located basically the same way as John's kissing Mary (JM) is located at Tom's party (T) when it is said that John kissed Mary at Tom's party. Notice that such a location is *prima facie* that in space-time for T locates JM both spaciouly and temporally at once. T is not an exclusive location of JM however, i.e. JM shares T with some other events. The advantage of pointless continuum is that it makes it possible to define exclusive locations following the same vein. Suppose that a discussion D took

all the seminar S. What make D and S non-identical is a fact that besides D S has temporal boundaries which are its beginning B and its end E. Then S may be called an exclusive location of D. *Ex definitio* S' s boundaries are not located at S. Although B and E are also analyzable (i.e. have parts) there is no boundaries between B and D and between D and E.

Finally I distinguish between places and times to support the intuition which says that events may occur at the same place in different times and otherwise at different places in the same time. Denote «B is a location of A» as $L(A,B)$. Suppose two different sets of events P_0, \dots, P_k and T_0, \dots, T_k . Then consider events E_{ij} such as:

$$L(E_{ij}, P_i) \ \& \ L(E_{ij}, T_j)$$

Then it is said that P_i are *places* and T_j are *times* of E_{ij} . An example based on formal theory is provided.