4.5A Independence of Simultaneous Non-Microconstant Trials

Sufficient conditions for the independence of simultaneous micro-dynamic trials in a complex system, when the evolution functions are not microconstant

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The following argument refers to the problem as it is set up in section 4.54 of *Bigger than Chaos*; see especially figure 4.4.

I will give the argument that experiment A in figure 4.4 is microconstant; the argument for B is, of course, identical. If there is at least one trial between W and X, then A is a trial on a multi-mechanism experiment, and so, because the conditions for the independence of chained trials are by assumption satisfied, it is microconstant (for reasons given in sections 3.74, 3.76, and 3.7A).[1] If W occurs immediately before X, but X is microconstant, then A is identical to X and is therefore microconstant.

The only other possibility consistent with the satisfaction of the assumptions required for the independence of sequential trials is that W occurs immediately before X, that X is not microconstant, but that the IC-evolution induced by W is folding and well-tempered. In this case, I use a simple redescription to construct a microconstant A from the non-microconstant X. A will be identical to X except for its IC-variable; by packing additional information into the microvariable for A, I make A microconstant even though X is not.

The technique, which assumes familiarity with section 3.7A, is as follows. Because IC-evolution on W is folding, a set of IC-values for W determines both a member of W's buffer partition and a set of IC-values for X. What I want to do is to put an index identifying the buffer partition member together with the IC-values for X to create a new value concerning which (a) the buffer partition member index is high level information and (b) the IC-value for X is low level information. This new value will be the IC-value for A.

Suppose, to take a simple example, that X has one IC-variable ζ that takes on any real value between 0 and 10, and that W's buffer partition

1. If X is not microconstant and there are only a few trials between W and X, the multi-mechanism experiment may not be very microconstant. In such circumstances, use the construction described below for the case where W immediately precedes a non-microconstant X.

has twenty members. I assign the twenty members of the buffer partition each an index, say an integer i between 1 and 20, and then define the IC-variable ζ' for A to be

$$\zeta' = 10i + \zeta$$

where ζ is the IC-value for X and i is the index of the buffer partition member picked out by the IC-value of W. Because the mechanism for A is just the mechanism for X, the evolution function for A will depend only on the value of ζ, so adding the high level information to the IC-value for A makes no difference to the behavior of A, which will be, as desired, identical to that of X. The point of all this is that the evolution function for A will be microconstant, with a constant ratio partition corresponding to W's buffer partition. (Note that this construction is possible only because X is embedded in a chain with folding IC-evolution; otherwise, i would be undefined.)