Binder and Privman Reply: The Comment [1] draws several inaccurate conclusions from our presentation [2,3]. First, there is the claim [1] that we "miss... the *noisy structure*." On the contrary, we do allow for the presence of noise (with no characteristic frequencies): See the text following Eq. (1) of [2].

More generally, our Letter was centered on the observation that second-order (in time) dynamics implies that certain collective states in complex systems may follow essentially a time evolution which in terms of the average, thermodynamic-limit order parameter $m(t)$ is fully deterministic and *reversible*.

As a result, the droplet-type arguments which seem to involve irreversible dynamics, advanced for $D>1$ models [4,5], do not apply in this case although the mechanism of their breakdown can be fully illuminated only after the spatial self-organization is described theoretically. Loosely speaking, reversibility implies that for any locally disordering mechanism there should exist a reversed locally ordering mechanism. It seems likely that neither of these processes involves droplets.

The point is, however, that the presence of the "thermodynamic noise" [5,6] is not crucial to these considerations. One might speculate that the presence of noise makes the "reversibility" property apply only in the strict thermodynamic limit. However, with this reservation in mind, the argument applied quite generally to collective states in 1D automata which show no significant noise [7] as well as to noisy $D>1$ automata [5,6]. In fact, a recently proposed mechanism of emergence of periodic, and possibly quasiperiodic, collective behavior [8] by formation of small, stable synchronized subsystems, seems to apply equally well in $D=1$ and $D=2$, while for $D>2$ there were no numerical checks reported.

Explanation of the spatial synchronization mechanisms in $D>1$ automata, presumably also clarifying the nature of the noise, remains of major interest [8]. Consequently, we did not claim (as implied in [1]) that the *spatial* self-organization mechanism is the same for 1D and $D>1$ models. In fact, we explicitly state that the mechanisms need not be the same, in the penultimate paragraph of [2].

Finally, the Comment [1] reminds the reader that quasiperiodicity can be described by continuous-time dynamics as well, emphasizing that such dynamics would involve *two* (or more) incommensurate frequencies. However, our Letter [2] was based on the fact that only a *single* basic frequency incommensurate with the "clock" frequency of the discrete cellular-automaton time evolution was needed to fit numerically data available both in $D>1$ and $D=1$; see [9]. One cannot disregard these *numerical* findings on aesthetic grounds alone; no opposing numerical evidence was offered in the Comment.

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[1] J. A. C. Gallas, H. J. Herrmann, H. Chaté, P. Manneville, and P. Grassberger, preceding Comment, Phys. Rev. Lett. **71**, 1955 (1993).
[2] P.-M. Binder and V. Privman, Phys. Rev. Lett. **68**, 3830 (1992).
[3] Further numerical examples can be found in a short review by P.-M. Binder and V. Privman, Mod. Phys. Lett. B **6**, 1835 (1992).
[4] C. H. Bennett, G. Grinstein, Y. He, C. Jayaprakash, and D. Mukamel, Phys. Rev. A **41**, 1932 (1990).
[5] J. A. C. Gallas, P. Grassberger, H. J. Herrmann, and P. Ueberholz, Physica (Amsterdam) **180A**, 19 (1992).
[6] Review: H. Chaté and P. Manneville, Prog. Theor. Phys. **87**, 1 (1992).
[7] P.-M. Binder and V. Privman, J. Phys. A **25**, L755 (1992).
[8] Y. Pomeau, J. Stat. Phys. **70**, 1379 (1993); J. Hemmingsson, A. Sørensen, H. Flyvbjerg, and H. J. Herrmann, Report No. HLRZ-14/93 (to be published).
[9] P.-M. Binder, B. Buck, and V. A. Macaulay, J. Stat. Phys. **68**, 1127 (1992), and unpublished results.