Chaos, creation and order in the 4th Symphony of Roberto Gerhard. Analysis of the dynamic of the System

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> "For ten years, paint bamboo. Then, become bamboo. Finally, paint without thinking of bamboo".
> Roberto Gerhard, *The music and muse today* (1962).

The Spanish composer Roberto Gerhard (1896-1970), who was part of the Second Viennese School, inherited an enthusiasm for ethnomusicology from his teacher Pedrell and from Joan Amadés. Gerhard himself is one of the key links between 19th century tradition and modernity, and is, according to some academics, one of the important names in the development of serialism in Europe.

The 4th Symphony is his last orchestral work, and shows the culmination of his technical evolution applied to a big instrumental group. In this work he combined his theory about proportions, applied to variables. He included ¨pitch time set¨ and created complex systems that produce both turbulence and coherence at the same time. In words of Richard Steinitz: 'What looks like random behaviour may, from a different perspective, reveal an exquisitely fine structure.'[1]

Gerhard applied a newly developed method for dealing with complex systems. He used the early stages of a developing terminology of complexity in his own articles. Indeed, the quotation in the beginning of this abstract, is a metaphor that John H. Holland explained 26 years later, in his book *Emergence: From Chaos to Order* (pp. 211-2):

> Only when you are so familiar with the elements of your discipline that you no longer have to think about how they are combined, do you enter the creative phase.[2]

In this paper I will explore the elements that Gerhard used in his 4th Symphony, both ontological and epistemological, and I will demonstrate how in this work diachronic and synchronic emergence are very clear, and originate from the numerical technique of Gerhard (from the proportions technique and from the ¨pitch time set¨). Significantly the definition of adaptive agents that interact in the Symphony and its translation in graphics are generated with StarLogo (a programmable modelling environment for exploring the workings of decentralized Systems, by MIT). I will explore as well, the use of different agents, which take the listener to a multilevel complexity sound experience, arising from the ambiguity and the hypothesis created in the listener himself.

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[1] Richard Steinitz, 'Music, Maths & Chaos', *Musical Times,* 137 (Mar. 1996), p. 17.

[2] John H. Holland, 'Emergence: From Chaos to Order' (OUP, Oxford, 2000) pp. 211-2