

The Theater of Mathematics and the Mathematics of the Theater

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The high frequency of theatrical analogies and metaphors in most fields of research and social life is symptomatic of the capacity of the theater to capture and express some fundamental situations related to thinking, to language, to human and social action, and behavior. The Shakespearean slogan “the world is a scene” is of increasing validity, due to several factors among which are: the more and more systemic nature of culture, the move from static and structural aspects to dynamic, processual, interactive aspects; the trend towards conflictual and paradoxical situations, as central and unavoidable features of nature and of human society; the increasing role of convention, of artifice, of “mise en scene” (staging), by modifying the natural, intuitive, historical order of facts and by adopting some artificial constructions (such as, for instance, in science, axiomatic-deductive systems, formal systems, cognitive models, etc.) that can be considered hypothetical-explanatory scenarios about some insufficiently known facts or processes; the increasing importance of strategic games and of decision problems based on compromise, at the expense of the traditional optimization problems; the increasing importance of invention and of play in any creative activity; the increasing interaction between the subject and the object, between the observer and the observed phenomena, associated with the attenuation of the border between the former and the latter.

Seventy years ago, Buchanan ([1]:175-197) devoted, in his book of poetry and mathematics, tragedy and comedy, taking as starting point the phenomena of “hybrids” and “nemeses”. In contemporary mathematics, all convergence and limit processes, including continuity, differentiability and integrability too, have a structure of theatrical dialogue, as it was implicitly suggested by Courant & Robbins [2], but already anticipated by Zeno in his famous “Achille and the tortoise” paradox. We have given an explicit presentation of this fact in [8], where we have also shown that important fields of research, such as theory of strategic games, future studies, psychology, planning, political science take advantage from a theatrical vision and from some bold theatrical metaphors. Things happen similarly in linguistics, computer science, narrativity, etc.

The beginning of the mathematics of the theater is located in the XVIIIth century, being associated with Goethe’s and Carlo Gozzi’s remark about the number or possible dramatic situations. This number, equal for them to 36, called attention to the combinatorial aspects of theater and it is discussed in detail by Polti [12]. A more sophisticated combinatorial analysis is proposed by Souriau [13], while, much later, Ginestier proposes [3] a geometric approach to theater. Here stops what we call the prehistory of mathematical teatrology. We should add to this prehistory also some Russian authors. As a matter of fact, simple statistics was already applied often enough, but qualitative mathematics applied to theater seems to be something new.

In 1966, we had the opportunity to teach a class of mathematical teatrology at the Faculty of Letters of the Bucharest University. Our point of departure was the idea to associate to any theatrical play A a Boolean matrix, where the columns are associated to the scenes of A, in their chronological order, while the horizontal lines are associated to the characters of the play. At the intersection of the line of the character a with the column of the scene b we insert the digit 1 if a appears in b and the digit 0 if a does

not appear in b. The mathematical and computational processing of this apparently very primitive information leads to a lot of results with high theatrical relevance. In some further steps, the dramatic dialogue is also considered and various mathematical methods coming from game theory, graph theory, theory of sets, algebra of binary relations, probability and information theory, formal grammars are used; see, in this respect, [4], [5], [6], [7], [8], [9], [10], [11]. This new field is at the very beginning, although, as it can be seen from the bibliographic references, given in [6] and [7] and from the authors involved in [9], [10], and [11], many papers were already devoted to it. Mathematical methods were already applied to the great old Greek tragedies (such as those of Aeschylus), to Shakespeare, to Corneille, Racine, and Moliere, and to some modern, more recent theatrical plays.

References

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