

# Mathematical Theory of Chromatic Plane Ornaments (Pure

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## PERSISTENCE OF FORM IN ART AND ARCHITECTURE: CATENARIES, HELICOIDS AND SINUSOIDS

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**Abstract.** The human mind tends to recognize numbers, shapes and forms in the external world. Geometric shapes persist in Art and Architecture from Prehistory to Modern Age. In this paper we report about an ongoing investigation into this persistence, starting from sinusoids and oscillations, catenaries and helicoids, chosen as possible organization centers of the many recognizable forms. The aim is to understand how, when and why this persistence of forms has accompanied the parallel evolution of Art and Science. Examples are chosen from Mesopotamian Art, Gothic, Islamic Art, Baroque and Modern Architecture.

**Key words.** Catenaries, sinusoids, helicoids

*Mathematics Subject Classification:* 01A45, 01A40, 01A35

### 1. Introduction

The human mind tends to recognize numbers, shapes and forms in the external world. Visual perception is transformed into proportions and geometrical shapes that artists and architects have used in all ages of History to produce their artworks, from paintings in caverns to modern visual artifacts, from carved stones to urban design, from elementary drawings to mechanically planned drawing and computer generated images. Forms have been recognized in Nature, used for their aesthetic value or because of their functionality, probably first understood at an emotional level, to be later elaborated at more conscious levels, gradually passing from emotion to formal theorization, and thence to planning, by exploiting the predictive power of the formalized models. At times forms, by becoming reproducible and recognizable, lent themselves to visual symbolic communication, therefore linking to other realms and semantic purposes. In the framework of a more general project on the persistence of form (to which our papers [1],[2],[3],[4] refer) we present here our preliminary investigation about some specific curves and curved surfaces.

There is a potentially infinite family of «geometrical shapes» and structures that have crossed the ages and the cultures, from Prehistory to our days, from Orient to Occident, giving rise to what we can call the «persistence of forms» (see [5], [6]). The three families of curves and surfaces

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