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Research

Mathematics as the Vital Force of Architecture

Abstract. This article shows that mathematics serves as a vital force in architecture. By comparing the characteristics that Hans Driesch attributes to the vital force with the characteristics of mathematical proportions in architecture, this paper demonstrates that both can be seen as principles of individuation, both can be the source of equipotentiality, and both are manifested in harmony.

Introduction

Mathematics is usually considered a device of abstraction from every living, and therefore changing, aspect of reality. Considering architecture from the point of view of mathematics is usually understood as turning it into an abstract entity, eternal and frozen. Contrary to that conception, I claim in this paper that in architecture mathematics is used as a vital force. In spite of the common conception of mathematics as contrary to the living aspect of things, the association of mathematics with life is not totally absent, either in general or in architecture. For example Sir D’arcy Wentworth Thompson (1860-1948) uses mathematics not as something that freezes life but as a tool for analyzing its dynamic aspect. In architecture this association exists in two versions: one is the mathematical interpretation of “organic unity”, for example in Alberti’s theory, and the other is the mathematical analogy between man and column found in Vitruvius and his disciples. However, here this association will be presented in a somewhat different way. I connect it to a theory of life called “vitalism”, and especially to that theory as presented in the writing of the biologist Hans Driesch (1867-1941).

According to Driesch, life cannot be fully explained by material rules. The rules of matter explain only the material aspect of the living organism, not its form. In order to explain the latter aspect, Driesch and the Vitalists turn to a principle which is not reducible to matter. This principle Driesch calls the “vital force”. He says that this is a principle of individuation, that the evidence for its existence is the harmony that is found in organisms and that they are characterized by equipotentiality [Driesch 1908, 1: 76-149; 2: 310-318]. What I would like to demonstrate here is that in the case of architecture, mathematics is meant to be a principle of individuation of matter and that it is expressed in harmony and in equipotentiality.

The “vital force” as a principle of individuation

Driesch sees the vital force as a universal principle which by its embodiment in matter turns a piece of matter into an individual. The individual identity of this piece of matter from which the organism is made, which distinguishes it from the rest of the material in the world, does not depend on a material identity but on its vital force. In order to clarify this point, one may compare the organism to an inanimate object – for example, this cup I hold.
in my hand. It is not identical to another cup which stands on my desk although they look the same. That is, if I were to switch between them and hold the other cup, we would say it is not the same cup. It is not identical because it is not made from the same piece of matter. Therefore the identity of the cup depends on a material identity. When we say that this is the same object, we mean that its material identity is enduring. Let us say that in the first cup there is some coffee. We will say that it is the same coffee only if its material identity endures. If, on the other hand, I drink the coffee and pours more coffee into the same cup, we would say it is not the same coffee that was there before.

In contrast, in the organism the matter changes all the time but nevertheless we say it is the same organism. For instance, the identity of a cat does not depend on persistence of the matter it is made of, but on the contrary, on the constant replacement of this matter. The cat is exactly the same cat as long as its matter changes, but when it stops changing, the cat dies and in a way it is no longer a cat. Its individuality dissolves. The piece of matter that is what remains of the cat decomposes and once again becomes one with all earthly matter.

According to the Vitalists, what makes the cat a cat is some sort of vital principle (force) which uses matter but is external to it. This means that the cat stays the same cat in spite of its lack of material identity because of a principle, and not because of something material.

*Equipotentiality as a testimony to the existence of the vital force*

According to Driesch, one testimony to the existence of a vital force in the organism is what he calls “equipotentiality”. Equipotentiality means that any piece of matter in the organism (at least in the early phase of its development) contains the potential to obtain the form of the whole organism. Driesch arrived at this conclusion after carrying out an experiment on a sea urchin, in which he eliminated half of the egg’s cell. At the beginning, the cell evolved in the form of half its usual form but later it changed into an organism with a complete form. The same tendency was evident in a low sort of organism, clavellina. Driesch had cut only a part of it. At first the part lost its form, but then it organized itself into a new, smaller organism. He did another experiment, with a sea rose named tubularia, which has the form of a stalk with a head. Driesch observed that wherever he cut the stalk it grew a new head. What struck Driesch was that the proportion between the stalk and the head was always similar (remained stable). From all these findings Driesch concluded that the organism is an equipotential system, that is, every part of it has an equal potential to evolve into any part, or into the whole.

![Tubularia](image-url)