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From pointillism to E-infinity electromagnetism

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Abstract

Pretty much like in a pointillism masterpiece of say Georges Seurat or Paul Signac, quantum space-time, which is in reality a collection of transfinite discrete set of points, appears when observed at a distance to be a nowhere disjoined continuum. This geometry which is best described by its Hausdorff dimension leads us ultimately to a radical change of some of our most basic mathematical assumptions with regard to the corresponding symmetry groups. Thus instead of being restricted to an integer value of the order of these symmetry groups, it seems natural to extend this order to the realm of irrational transfinite numbers. This step is not as strange as it may seem when we consider the role played by the factorial function **n!** in elementary group theory and its extension for non-integer value of **n** using the well-known Gauss' Gamma function.

Proceeding in this way, we find that the space-time of E-infinity theory constitutes a transfinite pointillism setting in which all fundamental interactions could be accounted for via the corresponding transfinite order of its symmetry groups and finally we find a conservation equation from which the exact inverse fine structure constant $\bar{\alpha}_o$ may be accurately determined.

1. Introduction

Impressionism is generally regarded as the beginning of what has been termed L'Art Moderne [1]. An offspring of that is the so-called neo-impressionism, a movement founded by Georges Seurat which developed a painting technique appropriately called "pointillism". The philosophy of the main exponents of pointillism such as Georges Seurat and Paul Signac maybe summarized in the belief that the "complementary and elementary" colors should remain pure, unmixed and should be mixed in the eye and subsequently the consciousness of the observer [1]. At least Seurat thought of himself as a quasi-scientist and his methodology as scientific [1]. This somewhat naïve but charming proposition is at least on one count incorrect.

To be in principle correct, Seurat needed at a minimum, a transfinite discrete collection of points rather than simply a collection of discrete points where we are stressing the word transfinite [2,3]. As an example, we refer to one of Seurat's (Fig. 1) painting where the granular character gradually disappears with increased distance between the picture and the observer, similar to E-infinity quantum space-time [2–4]. One may be tempted here to regard the line element based pictures of Van Gogh [1] as a stringy realization of space-time, whereas the pictures of Mondrian [1] and the cubist paintings of Picasso [1] may naively be interpreted as membrane and $P = 3$ brane space-time theories, respectively [2–4].

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Fig. 1. Georges Seurat, French, 1859–1891, A Sunday on La Grande Jatte – 1884, 1884–86, Oil on canvas, 81 3/4 × 121 1/4 in. (207.5 × 308.1 cm), Helen Birch Bartlett Memorial Collection, 1926.224, The Art Institute of Chicago. Photography © The Art Institute of Chicago.

In the present work, we like to motivate our use of transfinite symmetry groups and use it subsequently to derive the electromagnetic fine structure constant [5–7].

2. From space-time Hausdorff dimension to transfinite symmetry groups

One of the most fruitful mathematical concepts employed in physics today is that of a fractal, or more precisely, Hausdorff dimension [1–7]. In the most simplistic terms, the Hausdorff dimension of a geometrical shape is an extension of our ordinary notion of a topological dimension from an integer to a non-integer and very frequently an irrational value [1–7]. The importance of the utility of such a trivially unintuitive extension of the notion of dimensions is not in question and the countless papers published in the last four decades bears witness to this fact [8,9]. For this very reason, it would seem most natural to contemplate extending the measure of the possibilities of a symmetry group beyond an integer. The need for such an extension should not come as a surprise, for after all the order of a group is basically the dimension of this group. In fact the involvement of the factorial function [11]

$$n! = n(n-1)(n-2)\ldots$$

which is involved on a basic level in measuring the order of an elementary symmetry group and its extension to the Gamma function $\Gamma(n)$ [8] is a sufficient explanation for the need of an extension of the notion of dimension of a symmetry group similar to that of a Hausdorff dimension of a quasi-manifold. A simple example for such an extension might be in order at this stage.

Let us consider the dimension of the unitary symplectic Lie group $\mathrm{sp}(2n)$ or the real symplictic group $\mathrm{sp}(2n,R)$. In both cases, one finds [12]

$$\mathrm{Dim}\ \mathrm{sp}(2n) = \mathrm{Dim}\ \mathrm{sp}(2n,R) = 2n^2 + n$$

For the physically important case of $n = 8$, one finds