Combinatorial Physics

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Preface

It is nearly fifty years since the authors of this book began a collaboration based on their common interest in the foundations of physics. During that time others have made very major contributions. The fruits of this cooperative enterprise, particularly of the later part of it, are set out here. One problem has led to another. Over that time it became clear that such existing preconceptions as the space and time continua formed an inadequate basis for a physics which has to incorporate a quantum world of discrete character. Here we argue that the impossibility of reconciliation between continuous and discrete starting points means that we must start from the discrete or combinatorial position. Otherwise the quantum theory will remain with confusion and muddle at its centre.

If intuitive clarity is to come from the combinatorial approach it turns out to be hard won because continuum ideas are so deeply embedded in orthodox physics. It has been possible to travel only part of the way but that has been far enough to reveal another positive aspect of the approach. Discreteness is intimately related, according to our theory, to the existence of *scale-constants*—those dimensionless constants commonly thought by physicists to be of some fundamental significance. We should therefore be able to calculate these. Here we are able to detail the calculation of one, the fine-structure constant, which Paul Dirac emphasized for much of his life as an outstanding problem in the completion of quantum electrodynamics. Our value agrees with the experimentally determined one to better than one part in 10^5 . The calculation of dimensionless constants will bring to mind the name of Eddington, and although his work was the original cause of the authors' meeting, and although they agree with him in seeking a combinatorial origin for these constants, their mathematical method, and certainly their calculations of the values of those, have nothing in common with his.

This is a book about physics but philosophers will find that some issues — once their province — which they thought dead and decently buried, are resurrected to new life here. Notable among these is the place of mind. The great originators of the quantum theory knew that the action of the mind (or the “observer”) had to be part of the theoretical structure, but this development has been aborted. In combinatorial theory there is no escape from the issue. In somewhat the same way, since computing is essentially combinatorial, people in and around computer science may find our representation of physics more natural to them than it is to some orthodox physicists. None the less it is primarily the physics community we seek to inspire to carry further a project of which this is the beginning.

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