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Paul Adrien Maurice Dirac, one of the greatest physicists of the twentieth century, died in 1984. Dirac's College, St John's of Cambridge, generously endowed annual lectures to be held at Cambridge University in his memory.

This volume contains a much expanded version of the 1994 Dirac Lecture presented by Nobel Laureate Pierre Gilles de Gennes. The book presents an impressionistic tour of the physics of soft interfaces. Full of insight and interesting asides, it not only provides an accessible introduction to this topic, but also lays down many markers and signposts for interesting new research possibilities. The text begins with a brief discussion of wetting and dewetting and then goes on to consider the dynamics of different types of interface before considering adhesion and polymer/polymer welding.

Condensed matter physicists, material scientists, physical chemists and chemical engineers will find this book of interest.

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The 1994 Dirac Memorial Lecture

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Collège de France, Paris



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Introduction

Dirac was a man who concentrated on the difficult problems of his time. He was principally interested in the basis of quantum mechanics and the elementary particles. However, on one occasion, around 1938, he did write a paper which went to the opposite extreme and discussed the size of the cosmos and the age of the universe in terms of very simple dimensional analysis; such data is still alive and well and still food for thought.

As the centuries have gone by, physicists have of course tended always to move in those directions where great problems remain, and I think if one looks at the progress in physics until, shall we say, the 1940s, they have definitely concentrated on very small things – atoms and small molecules. In the period, in the fifties, then the sixties, it was realised that the methods of physics could be applied to other regions which lay above the atomic scale of, shall we say, everyday life – and by that I mean below the scale of what one normally thinks of as hydrodynamic phenomena. There was a mesoscopic physics, an inter-

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Introduction

mediate scale where the ideas and the methods of physics could work and make progress. One of the leading workers in this area, one of the prophets, is Pierre Gilles de Gennes. In the last few decades he has produced an enormous number of ideas which have been directly applicable to the experimental world, and which indeed have come to dominate our study of that world. It will be one of these areas that he will talk about here.

He is a man who has received many great honours, and perhaps to the outside world his Nobel Prize is the summit of these honours. I'm very proud to say that the University awarded him an honorary doctorate *before* he got the Nobel Prize, because any university can award one after someone gets the Nobel Prize. I think it is clear there was a proper appreciation here of his talents, and I am very pleased that the Dirac Lecture of 1994 is now to be given to us by Pierre Gilles de Gennes.

Professor Sir Sam Edwards