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# Contents

Preface page xi

### Introduction

1

What I take to be an interpretation of quantum mechanics, and why any further interpretation is needed: the chief problems with the most popular existing interpretations (both Copenhagen and non-Copenhagen).

### 1 Overview

26

Basic ideas of the interpretation to be presented here, together with idealized examples illustrating their application, including repeated Stern-Gerlach "measurements" and coupled spin-½ systems.

## 2 Dynamical states

63

63

Dynamical states as collections of quantum dynamical properties. The structure and evolution of dynamical states.

## §2.1 The hierarchy of quantum systems

How compound quantum systems are composed of their subsystems, and how their dynamical properties are related to those of their components. Prime and composite properties.

## §2.2 The structure of dynamical states

Conditions on properties contained in the dynamical state of a quantum system. How these conditions relate to the hierarchy of quantum systems, and to the presence or absence of interactions.

## §2.3 Dynamics

The dynamical law underlying the Schrödinger equation, and a stability condition governing dynamical states of interacting systems.

vii



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## 3 Measurement and quantum states

84

The nature of quantum states: measurement, preparation, and the derivation of the Born probability rules. Dissolution of the measurement problem.

#### §3.1 Measurement interactions

84

Measurements as quantum interactions. Definition of simple *M*-type interactions. Mimicking of the projection postulate through verifiability of measurement results. Motivation for the distinction between prime and compound properties.

#### §3.2 Idealizations relaxed

94

How the above account of measurement interactions may be rendered more realistic.

## §3.3 The assignment of quantum states

104

The character and legitimacy of quantum state ascriptions. Preparations as quantum interactions. Definition of the class of simple *P*-type interactions. Derivation of the Born rules in special cases.

## 4 Coupled systems

116

The present interpretation is applied to coupled systems of the type studied by Einstein-Podolsky-Rosen, Bell, and Aspect I: technical details.

### 5 Metaphysical aspects

137

The present interpretation is applied to coupled systems of the type studied by Einstein-Podolsky-Rosen, Bell, and Aspect II: metaphysical aspects and implications concerning holism, nonseparability, causal explanation, and causation. How quantum mechanics explains the observed properties of these correlated systems according to the present interpretation.

## 6 Alternatives compared

180

The present interpretation is compared to several existing interpretations in order to clarify its logical and genetic relations to them as well as to point out its advantages.

### §6.1 Naive realism

180

Comparison with an interpretation often attributed to Einstein.

#### §6.2 Copenhagen

184

Comparison with two prominent versions of the Copenhagen interpretation.

viii



Cambridge University Press
0521371058 - The Philosophy of Quantum Mechanics: An Interactive
Interpretation - Richard Healey
Table of Contents
More information

### §6.3 Everett

205

Comparison with Everett's relative state interpretation, popularly known as the "many worlds" interpretation.

#### §6.4 Kochen

216

Comparison with interpretative views put forward recently by Kochen.

## 7 Open questions

235

A number of open questions for the present interpretation are posed and discussed. These include the possibility of generalizing the present treatment of measurement and preparation interactions, of extending this interpretation to a relativistic theory, of investigating the nature of the stochastic dynamics underlying quantum probabilities in the present interpretation, and of proving certain important limit results.

### Appendix

253

261

265

Containing proofs of several results and lemmas stated and used in the text.

Selected bibliography
Index