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PREFACE

It is well known that the dynamical system theory (DST) starts from the following equations:

$$\boxed{\text{DST}} = \begin{cases} \frac{dx(t)}{dt} = f(x(t), u_1(t), t),\ x(0) = x_0 & \cdots (\text{state equation}), \\ y(t) = g(x(t), u_2(t), t) & \underline{\underline{(\text{measurement equation})}} \end{cases} \tag{D}$$

where u_1 and u_2 are external forces (or noises). Also recall that quantum mechanics is formulated as the following form:

$$\boxed{\text{quantum mechanics}} = [\text{the rule of time evolution}] + \underline{\underline{[\text{measurement}]}} \tag{Q}$$

(Schrödinger equation) (Born's quantum measurements)

The above two theories (D) and (Q) are, of course, fundamental and famous. Thus, a quarter of a century ago, I already knew them. However, about fifteen years ago, I was suddenly surprised by the similarity between (D) and (Q), particularly, the fact that:

(F) the term "$\underline{\underline{\text{measurement}}}$" is common to both dynamical system theory (D) and quantum system theory (Q).

This surprise urged me to propose "measurement theory". I want to share my surprise with all people.[1] This is the reason for this book.

Shiro ISHIKAWA[2]

21st, October, 2006

[1] Some sections of this book were lectured in the master-course program: "Advanced study of mathematics A" at Keio university (three-hour lecture every week from April to July in 2006).

[2] For the further information of our theory, see "http://www.keio-up.co.jp/kup/mfomt/"

It is recommended to read this book as follows: