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## PREFACE

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

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

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

$$\begin{array}{c|c} \hline \text{quantum mechanics} \end{array} = \begin{bmatrix} \text{the rule of time evolution} \end{bmatrix} + \underbrace{\begin{bmatrix} \text{measurement} \end{bmatrix}}_{\text{(Born's quantum measurements)}} \\ \hline (Q) \end{array}$$

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 "<u>measurement</u>" 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.<sup>1</sup> This is the reason for this book.

Shiro ISHIKAWA<sup>2</sup>

21st, October, 2006

<sup>&</sup>lt;sup>1</sup>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).

<sup>&</sup>lt;sup>2</sup>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:

