KOHEI OGAWA

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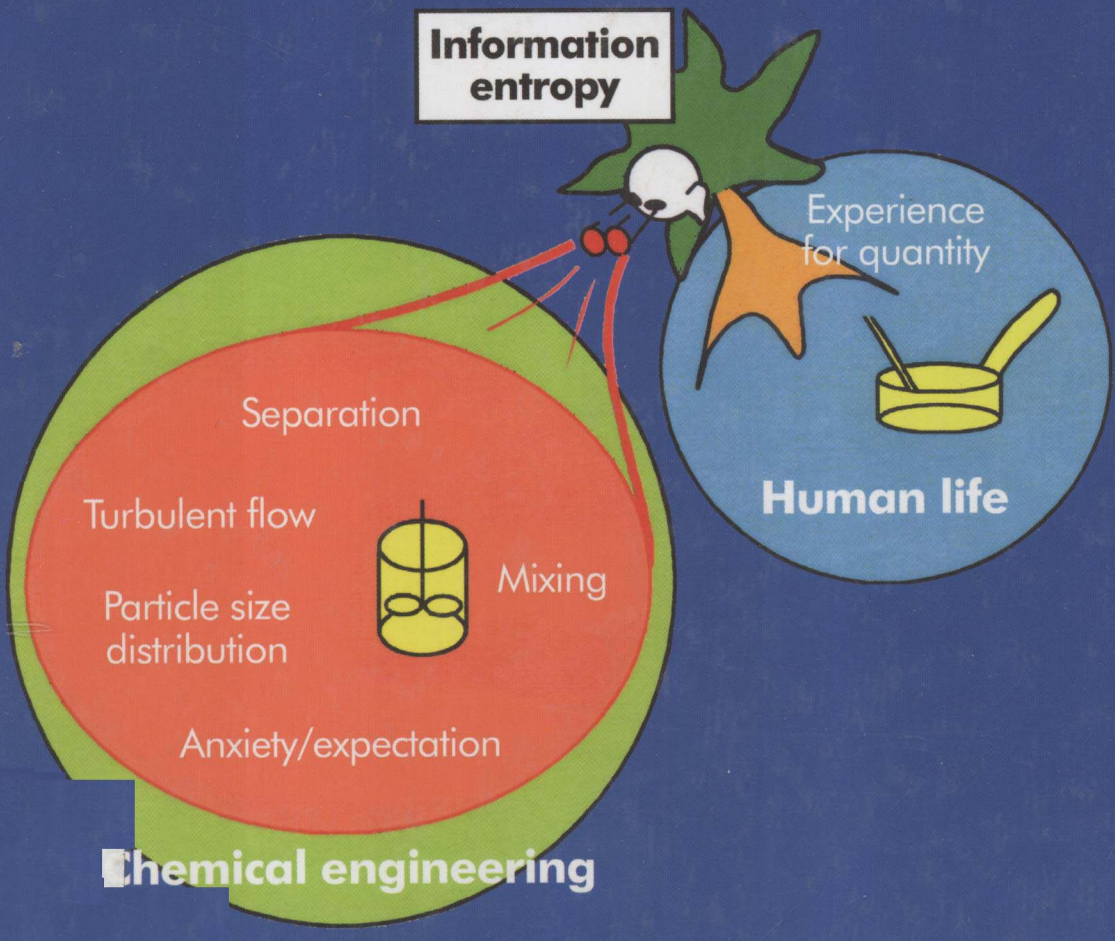
CHEMICAL ENGINEERING

A NEW PERSPECTIVE



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Kohei Ogawa
Tokyo Institute of Technology, Japan

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CHAPTER 1

Information Entropy

1.1 Introduction

The phenomena studied in chemical engineering are classified into two groups:

(1) definite phenomena that can be expressed by formulae such as differential equations,
(2) phenomena that can be expressed only by probability terms.

There is no clear scope to improve the methods of investigation of the phenomena that are expressed by formulae such as those in Newtonian mechanics. On the other hand, no two phenomena that can be expressed by probability terms are similar and as such, the methods used to investigate such phenomenon (e.g., the evaluation indices for mixing and separation operations/equipment) differ based on the nature of the phenomenon or process. In other words, there is no consistent technique for treating such phenomena that should be expressed by probability terms. The author has considered that such phenomena should be treated from a consistent viewpoint and reached to put on the glasses of information entropy to treat the phenomena. In this chapter, before discussing the main subject, the steps in the development of chemical engineering are surveyed; further, the necessity of a consistent viewpoint in chemical engineering is clarified. Next, the concept of information entropy and its important features are explained in detail. In addition, the sensitiveness of human experience for quantity is discussed in order to examine the suitability of the introduction of information entropy. It is believed that by at least comparing the expression for the amount of human feeling with that for information entropy, the suitability of the introduction of information entropy will be understood by those readers who have a strong intention to develop new fields in chemical engineering and new approaches for studying chemical engineering.

1.2 History and expectation

(1) From unit operation processes to total engineering in chemical engineering

Before agreeing to the introduction of the new way of thinking, it is necessary to understand the development process in chemical engineering. The American