

## Psychorheology and food texture research

*Sachio MATSUMOTO*

*The University of Osaka Prefecture*

Food, clothing and habitation form the requisites of life. Especially, food is essential to life. In every country in the world, the traditional and distinctive types of foods have been maintained and provided over many centuries. During recent years, processing technology has been developed rapidly for manufacturing a wide range of foods and meanwhile a lot of investigations on the texture and rheology of foodstuffs have been made successively by food scientists and technologists with a background of modern science history.

Rheology is characterized by the study of objective correlation between stress, strain and time for materials using the physical quantities of viscosity and elasticity. In 1939, Scott Blair, England, developed the field of "psychorheology" for obtaining informations on the correlation between the subjective sensory aspect of rheology. He initiated such a unique study on the sensory assessment made by craftsmen in bread baking and cheese making. A series of examination using a number of sensory panels suggested that the subjectively judgeable difference in viscosity and in elasticity can be expressed by the Weber-Fechner's law, which states that the degree of sensory response is proportional to the logarithmic strength of the stimulus. It was also suggested that the firmness of viscous materials is subjectively judged by the rate of flowing deformation, so that one makes an assessment of viscosity dynamically contrary to the static

judgement of firmness in elastomer

Sherman and his colleague, England, made a psychophysical study on the consistency of liquid foods. They clarified in a paper published in 1973 that the stimulus in the mouth for liquid foods appears to be the rate of shear developed at an approximately constant shear stress (about  $10 \text{ N m}^{-2}$ ), whereas it appear in the mouth for viscous foods to be the shear stress developed at an approximately constant rate of shear (about  $10 \text{ sec}^{-1}$ ).

In 1963, Szczesniak, U.S.A., made an attempt at analyzing sensory elements for assessing like and dislike of foods due to the associated words with respective food, and found that the food texture plays the most important role in the sensory assessment of foods. Therefore, she proposed a classification of textural characteristics, the so-called "texture profile", which was divided into three categories such as mechanical, geometrical and analytical (moisture content, fat content, etc) characteristics. The mechanical characteristics was also subdivided into five categories such as hardness, cohesiveness, viscosity, elasticity and adhesiveness. We can now examine each category from the mastication curve measured by means of "Texturometer".

Another effort is being made to analyze the mechanical characteristics with physical meanings of a variety of foods in the light of viscoelasticity. This intends to obtain a correlation between the stimulus and the sensory response so as to substitute for the physical qualities of foods. Consequently, rheology has relevance to acceptability by the consumer, *e.g.* the spreadability of margarine, the viscosity of cream soup, the toughness of beef steak, etc for all examples of this aspect.