The fine regulation of the body requires a complicated interaction of multiple signals including hormones, neurotransmitters, chemical or physical stimulus. The brain which received these signals integrates them with memory or experience, thereby inducing some behavior. In other words, the function of the brain is to select, decide, and execute behavior necessary for our life according to various situations. The brain has a lot of neurons and glia. These neurons and glia are not simple aggregation; build highly sophisticated networks in the brain. Thus, the brain functions as a system with many neural circuits. That’s a clear distinction between the brain and other organs. In order to understand the system or function of the brain, we have to address its hierarchy or characteristics from at least four viewpoints such as molecular mechanism, cell-cell communication, neural circuit, or crosstalk system between the periphery and central.

Recently, the field of molecular biology or cell biology made dramatic progress, and several kinds of substances were discovered. These substances have provided new insight into the molecular and cellular basis of the regulation of the body. In this session, Prof. Sakurai will be speaking about the role of neuropeptides, named orexins, in several kinds of behavior involved in feeding, emotion, reward systems and arousal. Orexins and their receptors were discovered by Profs. Sakurai and Yanagisawa in 1998. Orexin-containing neurons are restricted in the lateral hypothalamus, whereas its fibers project throughout the brain and accumulate in the monoaminergic nuclei. Sakurai et al. found that orexins, produced in the lateral hypothalamus, increase feeding. Following this finding, they also showed that orexins stimulate sympathetic nervous system and increase the level of arousal. In addition, they reported that the disruption of orexin system causes narcolepsy. Narcolepsy is a well known sleeping disorder which makes patients suddenly fall asleep for short periods time during the day. Taken together, the discovery of orexins, the examination of orexins’ action, and genetic approach reached pathophysiological elucidation of narcolepsy. Although the brain has been thought to be a mystery organ, identification of novel substances or development of radiant technology and genetic engineering gradually leads to resolution of that attractive mystery.

I believe that this session would provide the system of the body to adjust behavior in response to the alteration of environment or our requirements through a series of orexin studies.