International and Domestic Activities of the Physiological Society of Japan

JMAJ 55(3): 261–263, 2012

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"Physiology" investigates the mechanisms of the functions of life at all levels of structural complexity between the molecular and entire organism levels. Therefore, "Physiology" is one of the most important key disciplines among the biological sciences and represents the fundamental science that provides the basis for all the life sciences including medicine.

The Physiological Society of Japan (PSJ) was founded in 1922. The aim of PSJ is to promote research in the physiological sciences by providing free communications to members and by actively committing itself to the national and international scientific communities. The PSJ is active through meetings, publications, and committee activities. The Society publishes two journals: *The Journal of Physiological Sciences*, a bimonthly in English, and *The Journal of The Physiological Society of Japan*, a bimonthly in Japanese.

The PSJ Activities

Organization and committees

The PSJ now has around 2,750 members. The PSJ is administered by the Officers based on the decisions and discussion made at the Council Meetings. The PSJ Officers consist of one President, who is elected by a general election, and two Vice Presidents (Treasurer and Chairperson of Publication and Public Relations) as well as two Auditors. The PSJ Council has 32 members, and half of them are replaced by new members elected through a local election every other year. The PSJ has 15 Committees, as follows: Editorial Board of the Journal of Physiological Sciences, Publications and Public Relations, Membership, Election Management, Education, Science and Research, Research Ethics, International Relations, Long-Range Planning, Equal Opportunity for Women Physiologists, Awards, Corporation, Women in Physiology of Japan, Young Physiologists, as well as Promotion of Physiome and Systems Biology.

The PSJ has also established society awards to support young researchers and women researchers. The Hiroshi and Aya Irisawa Memorial Promotion Award for Young Physiologists, the Hiroshi and Aya Irisawa Memorial Award for Excellent Papers in The Journal of Physiological Sciences, the Hiroshi and Aya Irisawa Memorial Award for Excellent Papers on Research in Circulation in The Journal of Physiological Sciences, the Aya Irisawa Memorial Award for Excellence by Women Physiologists, promotional awards presented by regional meetings, and awards given by subgroups are used to reward excellent research.

At its Annual Meeting the PSJ holds a public lecture in an effort to disseminate knowledge within society at large.

Meetings

Since 1922, the Society's scientific meeting has been held annually except in 1944 and 1945 when all social activities suffered from tremendous difficulties resulting from World War II. The activities of PSJ were quickly revived after the end of the war. (Assembly of the 88th Annual Meeting of the PSJ (2011) in Yokohama was cancelled due to the Great East Japan Earthquake and was held in a journal through publication of a collection of abstracts.)

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Besides an Annual Meeting, the Society has frequent regional meetings in 7 major regions (Hokkaido, Tohoku, Tokyo, Chubu, Kinki, Chugoku-Shikoku, and Kyushu).

Publications

The Japanese language *Journal of the Physiological Society of Japan*, first published in 1936, reached its 73rd volume in 2011. The Society started publishing a journal in English, the *Japanese Journal of Physiology*, in June 1950. The name was changed in 2006 to the *Journal of Physiological Sciences*, which is currently at Vol. 61.

The PSJ has compiled and edited a glossary of physiology terminology in order to spread correct academic terms in the field of physiology. Since the *Lexicon of Physiology Terminology* (in Japanese) was completed in 1938, the book has undergone numerous revisions, with *The Terminology of Physiology*, completed in 1998, being in wide use.

In the area of the education of students of medicine and related fields, the Society edited the *Practical Guide to Physiology* in 1977 and the *New Practical Guide to Physiology* (both in Japanese) in 1991, which have been used in the laboratory training for students. At present, the Society is working on a new revision.

The Society's Education Committee edited and published the *MCQ-based Physiology Workbook* in 1995 and the *CBT-Compliant MCQ-based Physiology Workbook* in 2006, thereby playing a role in helping students' learning.

International activities

The PSJ is a member of the International Union of Physiological Sciences (IUPS) and the Federation of Asian and Oceanian Physiological Societies (FAOPS), the former of which Dr. Masao Ito served as president from 1993 to 1997 and Dr. Akimichi Kaneko served as president from 2005 to 2009. At present, Dr. Denis Noble of the UK has been serving as president since 2009 and Dr. Yoshihisa Kurachi, recommended by the PSJ, is serving as the first vice president of the IUPS. Dr. Yasunobu Okada, president of the PSJ, served as president of FAOPS from 2007 to 2011.

The IUPS holds a world congress once every four years (once every three years until 1989) at a different location in the world each time. The PSJ hosted the world congress twice: in Tokyo in 1965 and in Kyoto in 2009. Nearly 4,000 researchers from around the world gathered at the 2009 congress in Kyoto (IUPS2009), which was one of the largest successes from among all previous world congresses.

FAOPS also holds a congress once every four years in Asia/Oceania. In 2019, the PSJ will host the 9th FAOPS Congress in Nagoya (FAOPS 2019).

Recent Research Topics

Below are overviews of three recent research results communicated by members of the PSJ. More details on these results and other topics are available on the PSJ's website (http://int.physiology.jp/en/sciencetopics).

"Flexible network dynamics across cortical layers during memory retrieval" communicated by Dr. Daigo Takeuchi (Department of Physiology, The University of Tokyo School of Medicine)[1]:

Our capacity for memorizing and remembering things or facts (declarative memory), is so fundamental for us that without this capacity, we can hardly lead a day-to-day life—making breakfast, reading a newspaper or finding our way home. Accumulating evidence suggests that declarative memory is implemented by the neuronal network embedded within the temporal cortex. Recent studies have identified single neurons coding for declarative memories. However, to unravel the mechanisms of how the brain reads out the stored memory, it is essential to investigate the network mechanisms of memory signal processing. In this study, neuronal activities from all the cortical layers in the temporal cortex of monkeys performing a cognitive memory task were simultaneously recorded. Then, the direction of signal flow across cortical layers during visual object presentation and during memory retrieval was identified. It was found that, during visual stimulation, neuronal signals flowed from layers IV to II/III, and then to V/VI. During memory retrieval, in contrast, the direction of signal flows reversed: from layers V/VI to II/III. This finding suggests that our brain is implemented with interlaminar networks that can flexibly change the direction of signal flows depending on the cognitive demands.

"Subunit counting of the KCNQ1-KCNE1 ion channel complex" communicated by Dr.

Koichi Nakajo (Division of Biophysics and Neurobiology, National Institute for Physiological Sciences)[2]:

KCNQ1 and KCNE1 (both are known as causative genes of long QT syndrome) form an ion channel complex and regulate heart rhythm. To determine the stoichiometry of the complex, in this study, the number of KCNQ1 and KCNE1 subunits was directly counted by the following method, as per the method of Ulbrich (2007). By counting spontaneous bleaching events of single GFP molecules tagged on these subunits using a total internal reflection fluorescence (TIRF) microscope, it was determined how many GFP molecules (i.e. KCNQ1 or KCNE1 subunits) are included in one ion channel complex. Interestingly, the number of KCNE1 subunits in a single fluorescent spot was not fixed but flexible, and up to four KCNE1 subunits could bind to four KCNQ1 subunits (one ion channel). The average number of KCNE1 per one ion channel complex became higher when the relative expression density of KCNE1 against KCNQ1 was higher. As a higher expression density of KCNE1 subunits made KCNQ1 channels more difficult to open, the electrical activity of cardiac myocyte may be regulated by the relative expression densities of these subunits.

"Orexin neurons are indispensable for stress-induced thermogenesis" communicated by Dr. Wei Zhang (Department of Molecular & Integrative Physiology, Chiba University Graduate School of Medicine)[3]:

Stress increases cardiac function, ventilation, and body temperature. These changes will prepare for and support fight-or-flight behavior by increasing the supply of fuel and oxygen and by increasing conduction velocity of nerve impulses. We previously demonstrated that cardiorespiratory excitation during stress depends on the hypothalamic neuropeptide, orexin (review: Resp Physiol Neurobiol 174: 43–54, 2010). We examined whether the same is true for stress-induced hyperthermia. Orexin neuron-ablated mice (ORX-AB) showed an attenuated stress-induced hyperthermia while their basal body temperature is normal. The brown adipose tissue, which is a major thermogenic organ in rodents, did not respond to handling stress although it did respond to a direct pharmacologic stimulation. These abnormalities in ORX-AB were not observed in orexin knockout mice in which orexin peptide is deficient but neurons are preserved. Therefore, integrity (orexin and co-existing other neurotransmitter/modulators) of the orexin neurons is indispensable for full expression of multiple facets of the fight-or-flight response.

References

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