Preface

Biometeorology as a discipline of environmental biology has arisen from the need to analyze and understand whether and how environmental parameters assessed by meteorologists affect bodily functions. In general, the climate in which a population exists is defined by meteorological parameters. In particular, the impact of extreme local climatic parameters on human working performance has received early and increasing attention.

In Japan the foundations of biometeorological research were laid in biomedical science by Y. Kuno and his disciples. Their pioneering studies focused attention on the capacity limits of physiological functions to cope with climatic impact and their adaptive responses to diurnal and seasonal cycles. In particular, research centered on the diagnosis of patho-physiological disturbances caused by thermal stress, on the development of preventive measures and on methods to predict individual stress tolerance. It was shown early on that humans or animals improve their performance in stressful climates either naturally, by acclimatization, or intentionally, by acclimation. Moreover, old traditions based on medical experience making use of particular climatic conditions in the treatment of a multitude of diseases have become a subject of biomedical research.

The International Society of Biometeorology and Bioclimatology, was founded 1956 in Paris on the initiative of Professor Solco W. Tromp with the aim of achieving better communication and coordination of research in this particular discipline of environmental physiology. In 1963, the name of the society was changed to the International Society of Biometeorology.

Initially, a major focus of research in biometeorology was a better understanding of how humans or, generally, warm-blooded animals cope with changes in environmental parameters by adjusting their homeostatic control systems. The editors have titled this research area “Autonomic Regulation of Physiological Functions.” Contributions to biometeorology include analysis of physiological adjustments to temperature changes generated within the body and/or acting upon it. We discovered, for example, 1) the existence of thermal receptors in the spinal cord in 1962, 2) the phenomenon of regional differentiation in sympathetic efferent innervation in response to various thermal and non-thermal factors, as well as to pathophysiological challenges, in 1970, 3) non-thermal “competing demands” limiting the capacity of effectors serving thermal homeostasis, especially the salt/fluid balance and its neuro-endocrine control, which have been elucidated in general and, in particular, 4) better understanding of said salt/fluid balance with special consideration of the characteristics and adaptations of physiological functions of the aged, especially in response to thermal stress and fluid balance disturbances, in studies starting 1975.

In the course of scientific progress, research in biometeorology has expanded beyond its original definition for different reasons. Living subjects of investigation now range from micro-organisms to plants, to animals, including humans. Ecological aspects receive increasing attention. Humans have developed techniques and strategies to survive in extreme habitats. As a result, the term “environment” has become more broadly conceived by biometeorology as a field of research encompassing environmental impacts on life in general. A multitude of geophysical and geochemical factors have become incorporated. Investigation of diverse physical and chemical factors proceeds at macro- as well as micro-environmental levels. Along the same lines, biometeorology has expanded beyond the terrestrial sphere through the study of the impact of cosmic environmental factors. The current state of subject fields in biometeorology is listed in Table 1.

One of the most attractive aspects of studies in biometeorology is the usefulness of the interdisciplinary approach. Classical research in the field of physiologists, biochemists, and clinicians increasingly takes advantage of the contributions of experts in the fields of molecular biology, microbiology, epidemiology, engineering, geography, climatology, meteorology and others. Multi-disciplinary variability is considered essential to assessing new unique and valuable research results in bio-meteorological studies. For this reason, it is the aim of this special issue of our journal to mutually inform researchers working on various aspects of biometeorology with the hope of promoting joint multi-disciplinary research.
Table 1  Division of the Fields of Biometeorology published in IJB (Int. J. Biometeorol., 1:v-vi, 1957).

I: General Bioclimatology
A: History and biography
B: Bioclimatological teaching
C: Instrumentation
   1. General
   2. Phytological bioclimatology
   3. Zoological bioclimatology
   4. Human bioclimatology
D: Aerosols and chemical aspects of bioclimatology
E: Miscellaneous data (classification of climates, air masses, human typology, etc., as far as they affect bioclimatological observations)
G: World literature

II: Phytological Bioclimatology
A: General phytological bioclimatology
B: Agricultural bioclimatology
   1. General agricultural bioclimatology
   2. Agricultural phenology
C: Forest bioclimatology
D: Physiological phyto-bioclimatology
E: Pathological phyto-bioclimatology
F: World literature

III: Zoological Bioclimatology
A: General zoological bioclimatology
B: Entomological bioclimatology
C: Veterinary bioclimatology
D: World literature

IV: Human Bioclimatology
A: Physiological bioclimatology
   1. General physiological bioclimatology
   2. Geographical bioclimatology
   3. Ethnological bioclimatology
B: Social bioclimatology
   1. Social bioclimatology (general)
   2. Psychological bioclimatology (including aesthetico-bioclimatology)
   3. Archeological bioclimatology
   4. Acclimatisation bioclimatology
C: Pathological bioclimatology
   1. General pathological bioclimatology
   2. Meteorological pathology
   3. Climatological pathology
   4. Air pollution pathology
      a. Pollution with organic particles (pollen, fungi, etc.)
      b. Pollution with inorganic particles (dust, etc.)
      c. Chemical pollution

5. Geographical climatopathology
6. Climatotherapy
   a. Therapeutic climates (general)
   b. Thalassotherapy (climatological-)
   c. Heliotherapy
   d. Thermotherapy
   e. Aerosol therapy
   f. Socio-climatotherapy
   g. Climatic health resorts
   h. Other therapeutic methods
D: Urban bioclimatology
   a. General urban bioclimatology
   b. Architectural bioclimatology
   c. Sanatorium bioclimatology
E: World literature

V: Cosmic Bioclimatology
A: General cosmic bioclimatology
B: Special cosmic bioclimatology
C: World literature

VI: Paleo-Bioclimatology
A: General paleo-bioclimatology
B: World literature

VII: Miscellaneous Bioclimatological Data
A: Scientific Committees of the Society
   1. Reports
      a. Allergic diseases
      b. Ecological climatography
      c. Instrumentation
      d. Ionisation of the air
      e. Nautical bioclimatology (general-, cargo bioclimatology)
   2. Literature
B: Symposia or congresses of national bioclimatological societies (dates, programmes, summaries of important lectures, decisions, etc.)
C: Bioclimatological stations and institutions
D: Requests from members
E: Requests from non-members
F: Book reviews
G: International Organizations (WMO, FAO, WHO, etc.)
H: Advertisements
There is increasing awareness of the problems arising from global warming. Causes are still mostly regional, e.g., enhanced fossil fuel consumption and air pollution in industrialized countries and progressing deforestation and desertification in developing countries. However, the effects are global and are already becoming a serious threat to climatically sensitive regions of the world. The contributions to this special issue consider various regional health problems attributable to regional climatic changes and disastrous climatic regional events associated with changes in global atmospheric circulation. In the future, regional impacts of global climate change will become a focus of interest in Biometeorology. As an example, increasing annual temperatures coincide with deteriorating freshwater supplies for drinking and agriculture, especially in hot and arid climates. In addition to the general impairment of human living conditions due to scarcity of food and water, combined heat stress and dehydration will increase the incidence of life threatening heat disorders, especially, if they are aggravated by water and electrolyte losses due to dysenteric diseases caused by drinking contaminated water. One of the apparent consequences is enhanced migration pressure which will increase further, unless adequate measures are taken locally to improve human health and living conditions.

As a perspective, biometeorology has the power to contribute to global environmental research by pointing out the consequences of global warming for human well-being, in particular, and for the biosphere, in general. Knowledge about ecological disturbances which are already affecting human, animal and plant life, especially in climatically sensitive regions of the world, may provide helpful information on how to prevent further progression of ecological disturbances and how to re-constitute more favorable climatic conditions at both the regional and global levels.

Masami IRIKI
Professor Emeritus, Yamanashi University
Director Emeritus, Yamanashi Institute of Environmental Sciences

Eckhart SIMON
Director Emeritus, Max-Planck-Institute for Heart and Lung Research, Bad Nauheim
Professor Emeritus of Giessen University

Masami IRIKI
Masami Iriki is a Professor Emeritus of Yamanashi Medical University and a former Director of the Yamanashi Institute of Environmental Sciences. His interest is the mechanisms of homeostasis, and his work, especially the discovery of spinal thermal receptors in the field of thermal physiology and of regional differentiation of sympathetic efferents in the regulation of the autonomic nervous system, is highly regarded. He is active as a honorary member of the Physiological Society of Japan, the Japan Society of Neurovegetative Research, the Japan Geriatrics Society, the Japan Society for Biomedical Gerontology and the Japan Society of Biometeorology. He is a former Editor-in-Chief of the ‘International Journal of Biometeorology’ and presided at the 18th International Congress of Biometeorology, which held in Tokyo in September 2008. His recent published works include ‘The Textbook of Thermal Physiology’ and ‘Mechanisms of Temperature Regulation.’ He has served as an editorial board member of ‘Global Environmental Research’ from the first issue.

Eckhart SIMON
Eckhart Simon is an Emeritus Honorary Professor of Physiology at the University of Giessen, Germany, and Director Emeritus at the Max-Planck-Institute for Heart and Lung Research, Bad Nauheim, Germany. Fields of research are the Neurophysiology and Neuroendocrinology of homeostatic control: Temperature regulation, cardiovascular control, energy balance, salt and fluid balance. Research is focused on interactions between these homeostatic systems under conditions of environmental stress. In work on temperature regulation the multiple-input property of its control system was established by the discovery of distributed neuronal elements serving deep-body thermoreception. Analysis of circulatory control revealed specific response patterns of sympathetic fibers innervating the heart and functionally different vascular beds as a mode of cardiovascular adjustments to physiological and patho-physiological challenges. Neuro-endocrine control of energy balance and of salt and fluid balance are studied to elucidate how they adjust to the requirements of thermoregulatory homeostasis and cardiovascular performance. E. Simon served as a Field Editor of the European Journal of Physiology (Pfluegers Archiv) and as chairman of the Thermophysiology Section of the International Union of Physiological Sciences (IUPS). He is active as a member of the German and American Physiological Societies. He was granted honorary memberships of the Japanese Physiological Society and of the Purkyně Bohemoslovak Medical Society (Prague). He was an Edward F. Adolph Distinguished Lecturer of the American Physiological Society. He is a recipient of the Order of The Rising Sun, Gold Rays and Neck Ribbon.