# June 2013 Biology Paper A Level

One of the most interesting issues in immunology is how the innate and adaptive branches of the immune system cooperate in vertebrate organisms to respond and destroy invading microorganisms without destroying self-tissues. More than 20 years ago, Charles Janeway proposed the innate immune recognition theory [1]. He hypothesized the existence of innate receptors (Pattern recognition receptors, PRRs) that, by recognizing molecular structures associated to pathogens (PAMPs) and being expressed by antigen presenting cells (APCs) and epithelial cells, could alert the immune system to the presence of a pathogen, making it possible to mount an immediate inflammatory response. Moreover, by transducing the alert signal in professional APCs and inducing the expression of costimulatory molecules, these receptors could control the activation of lymphocytes bearing clonal antigen-specific receptors, thereby promoting appropriate adaptive immune responses. Since adaptive immunity can be activated also following sterile inflammatory conditions, it was subsequently proposed by Polly Matzinger that the innate immune system could be also activated by endogenous danger signals, generically called danger associated molecular patterns (DAMPs)[2]. The first prediction has been amply confirmed by

the discovery of Toll-like receptors [3; 4; 5] and cytoplasmic PRRs such as RIG-like receptors [6]. Other PRR families such as the NOD-like receptors and C-type lectins exert immunogenic or tolerogenic signals [7; 8; 9] and may recognize not strictly pathogens but also endogenous danger signals that may lead to inflammasome activation [10; 11] . Dendritic cells (DCs) have been identified as the cells of the innate immune system that, by sensing PAMPs or DAMPs transduce signals to the nucleus. This leads to a transcriptional reprogramming of DCs with the consequent expression of three signals, namely signal 1 (MHC+peptide), signal 2 (surface costimulatory molecules) and signal 3 (cytokines) necessary for the priming of antigen-specific naïve T cell responses (signal 1 and 2) and T cell polarization (signal 3). The reason why DCs are superior with respect to other professional APCs in naïve T cell activation has not been unequivocally defined but in vivo may mainly result from their migration capacity to secondary lymphoid organs. It has not been established whether DCs can provide a special “signal 2” or simply very high levels, compared with other APCs, of commonly expressed signals 1 and 2, so that a naïve T cell could reach the threshold of activation. A second aspect of DC biology needs also to be taken into account. Concerning the question of how self-tissues are not destroyed following the initiation of adaptive immune responses, different mechanisms of

central and peripheral auto-reactive T cell tolerization have been proposed [12]. In particular, it has been defined that high affinity T cells are deleted in the thymus, while low affinity auto-reactive T cells or T cells specific for tissue-sequestered antigens that do not have access to the thymus are controlled in the periphery. In a simplified vision of how peripheral T cell tolerance could be induced and maintained, it was thought that, in resting conditions, immature DCs, expressing low levels of signal 1 and low or no levels of signal 2, were able to induce T cell unresponsiveness. Nevertheless, it is now clear that a fundamental contribution to the peripheral tolerance is due to the conversion of naïve T cells into peripheral regulatory T cells (pTreg cells) and it is also clear that DCs need to receive a specific conditioning to become able to induce pTreg cell differentiation. Even more intriguing is that also DCs activated through PRRs, with particular Toll like receptor (TLR) agonists, are capable of generating pTreg cell conversion if these agonists induce the production of the appropriate cytokines.

As modern technologies continue to develop and evolve, the ability of users to interface with new systems becomes a paramount concern. Research into new ways for humans to make use of advanced computers and other such technologies is necessary to fully realize the potential of 21st century tools.

Human-Computer Interaction: Concepts, Methodologies, Tools, and Applications gathers research on user interfaces for advanced technologies and how these interfaces can facilitate new developments in the fields of robotics, assistive technologies, and computational intelligence. This four-volume reference contains cutting-edge research for computer scientists; faculty and students of robotics, digital science, and networked communications; and clinicians invested in assistive technologies. This seminal reference work includes chapters on topics pertaining to system usability, interactive design, mobile interfaces, virtual worlds, and more.

International law's role in governing disasters is undergoing a formative period in its development and reach, in parallel with concerted efforts by the international community to respond more effectively to the increasing number and intensity of disasters across the world. This Research Handbook examines a broad range of legal regimes directly and indirectly relevant to disaster prevention, mitigation and reconstruction across a spectrum of natural and manmade disasters, including armed conflict.

The proceedings were designed to bring together researchers who share a common interest in the quantitative description of the biological form. Participants came from very diverse disciplines such as agricultural genetics, botany,

entomology, forensics, human anatomy, paleontology, human evolution, primatology, dentistry, etc. The participants applied various methodological approaches that are being increasingly used to describe aspects of the biological form. These techniques include neural networks, Fourier descriptors, shape mapping, genome-wide association studies (GWAS), Riemann curves, surface mapping, etc. A number of the contributions in the proceedings represent state of the art research that reflects advances in that discipline. Contents:Botanical Studies:Leaf StructuresAgricultural CropsEntomological ExplorationsGenomic Shape ConsiderationsZoological InquiriesHuman Morphological Investigations:Facial MorphologyCranial Structures in 3-DWhole Body Studies Readership: Graduate students and researchers in human biology, genetics and genomics, plant science and agricultural science, evolution biology and dentistry and sports medicine. Keywords:Biological Shape Analysis;Agricultural Genetics;Botany;Entomology;Forensics;Physical Anthropology;Paleontology;Human Anatomy;Fourier Analysis;Applied Mathematics;Morphometrics

This volume seeks to foreground a “borderless” history and geography of South, Southeast, and East Asian littoral zones that would be maritime-focused, and thereby explore the ancient connections and dynamics of interaction that

favoured the encounters among the cultures found throughout the region stretching from the Indian Ocean littorals to the Western Pacific, from the early historical period to the present. Transcending the artificial boundaries of macro-regions and nation-states, and trying to bridge the arbitrary divide between (inherently cosmopolitan) “high” cultures (e.g. Sanskritic, Sinitic, or Islamicate) and “local” or “indigenous” cultures, this multidisciplinary volume explores the metaphor of Monsoon Asia as a vast geo-environmental area inhabited by speakers of numerous language phyla, which for millennia has formed an integrated system of littorals where crops, goods, ideas, cosmologies, and ritual practices circulated on the sea-routes governed by the seasonal monsoon winds. The collective body of work presented in the volume describes Monsoon Asia as an ideal theatre for circulatory dynamics of cultural transfer, interaction, acceptance, selection, and avoidance, and argues that, despite the rich ethnic, linguistic and sociocultural diversity, a shared pattern of values, norms, and cultural models is discernible throughout the region.

The pathogenic mechanisms underlying primary T-cell disorders are mainly related to molecular alterations of genes whose expression is intrinsic to hematopoietic cells. However, since the differentiation process requires a crosstalk among thymocytes and the thymic microenvironment, molecular

alterations of genes, involved in the differentiation and functionality of the stromal component of the thymus, may lead to a severe T-cell defect or failure of central tolerance, as well. The first example of severe combined immunodeficiency (SCID) not related to an intrinsic alteration of the hematopoietic cell but rather of the thymic epithelial component is the Nude/SCID phenotype, inherited as an autosomal recessive disorder, whose hallmarks are the T-cell defect and the absence of the thymus. The clinical and immunological phenotype is the human equivalent of the murine Nude/SCID syndrome, which represents the first spontaneous SCID identified in nude mice in 1966. For over 3 decades studies of immune system in these mice enormously contributed to the overall knowledge of cell mediated immunity, in the assumption that the athymia of these mice was solely responsible for the T-cell immunological defect. This syndrome is due to mutations of the transcription factor FOXN1, belonging to the forkhead-box gene family, which is mainly expressed in the thymus and skin epithelial cells, where it plays a critical role in differentiation and survival. An alteration of the thymic structure is also a feature of the DiGeorge syndrome (DGS), which has been long considered the human counterpart of the nude mice phenotype. This syndrome is frequently associated to a deletion of the 22q11 region, which contains approximately 30 genes, including the TBX1 gene, which is responsible for most

of the clinical features of DGS in humans and mice. In this syndrome common manifestations are cardiac malformations, speech delay, hypoparathyrodism and immunodeficiency, even though the immunological hallmarks of the T-cell defect in DiGeorge syndrome are profoundly different from those reported in human Nude/SCID. The divergence of the phenotype among these 2 entities raised the possibility that the FOXN1 transcription factor represents the real key stromal molecule implicated in directing the hematopoietic stem cell toward a proper T-cell fate. Thymic stromal component of the primary lymphoid organ is also required to negatively select the autoreactive clones, a process driven by the expression of tissue specific antigens (TSA) by medullary thymic epithelial cells (mTECs). The expression of genes encoding TSA antigens is mediated by autoimmune regulator (AIRE) gene, encoding a transcription factor expressed in mTECs. Molecular alterations of this gene are associated to autoimmune polyendocrinopathy candidiasis ectodermal dystrophy (APECED), a rare autosomal disorder, which may be considered the prototype of an autoimmune disease due to the failure of central tolerance homeostasis. All these "experiments of nature" led to unravel novel pathogenic mechanisms underlying inherited disorders of immune system and, of note, to clarify the pivotal role of epithelial cells in the maturation and education process of T-cell precursors.

As the amount of biological information and its diversity accumulates massively there is a critical need to facilitate the integration of this data to allow new and unexpected conclusions to be drawn from it. The Semantic Web is a new wave of web- based technologies that allows the linking of data between diverse data sets via standardised data formats (“big data”). Semantic Biology is the application of semantic web technology in the biological domain (including medical and health informatics). The Special Topic encompasses papers in this very broad area, including not only ontologies (development and applications), but also text mining, data integration and data analysis making use of the technologies of the Semantic Web. Ontologies are a critical requirement for such integration as they allow conclusions drawn about biological experiments, or descriptions of biological entities, to be understandable and integratable despite being contained in different databases and analysed by different software systems. Ontologies are the standard structures used in biology, and more broadly in computer science, to hold standardized terminologies for particular domains of knowledge. Ontologies consist of sets of standard terms, which are defined and may have synonyms for ease of searching and to accommodate different usages by different communities. These terms are linked by standard relationships, such as “is_a” (an eye “is_a” sense organ) or “part_of” (an eye is

“part_of” a head). By linking terms in this way, more detailed, or granular, terms can be linked to broader terms, allowing computation to be carried out that takes these relationships into account.

Can our planet support the demands of the ten billion people anticipated to be the world's population by the middle of this century? This book explores the contexts, costs, and benefits of a burgeoning population on our economic, social, and environmental systems.

The Cambridge IGCSE® Combined and Co-ordinated Sciences series is tailored to the 0653 and 0654 syllabuses for first examination in 2019, and all components of the series are endorsed by Cambridge International Examinations. Cambridge IGCSE® Combined and Co-ordinated Sciences Coursebook is tailored to the 0653 and 0654 syllabuses for first examination in 2019 and is endorsed for full syllabus coverage by Cambridge International Examinations. This interdisciplinary coursebook comprehensively covers the knowledge and skills required in these courses, with the different syllabuses clearly identified. Engaging activities in every chapter help students develop practical and investigative skills while end-of-chapter questions help to track their progress. The accompanying CD-ROM contains self-assessment checklists for making drawings, constructing and completing results tables, drawing graphs and designing experiments; answers to all the end-of-chapter questions and auto-marked multiple-choice self tests.

This book discusses the importance of identifying and addressing misconceptions for the successful teaching and learning of science across all levels of science education from

elementary school to high school. It suggests teaching approaches based on research data to address students' common misconceptions. Detailed descriptions of how these instructional approaches can be incorporated into teaching and learning science are also included. The science education literature extensively documents the findings of studies about students' misconceptions or alternative conceptions about various science concepts. Furthermore, some of the studies involve systematic approaches to not only creating but also implementing instructional programs to reduce the incidence of these misconceptions among high school science students. These studies, however, are largely unavailable to classroom practitioners, partly because they are usually found in various science education journals that teachers have no time to refer to or are not readily available to them. In response, this book offers an essential and easily accessible guide.

Human behavior and decision making is subject to social and motivational influences such as emotions, norms and self/other regarding preferences. The identification of the neural and psychological mechanisms underlying these factors is a central issue in psychology, behavioral economics and social neuroscience, with important clinical, social, and even political implications. However, despite a continuously growing interest from the scientific community, the processes underlying these factors, as well as their ontogenetic and phylogenetic development, have so far remained elusive. In this Research Topic we collect articles that provide challenging insights and stimulate a fruitful controversy on the question of "what determines social behavior". Indeed, over the last decades, research has shown that introducing a social context to otherwise abstract tasks has diverse effects on social behavior. On the one hand, it may induce individuals to act irrationally, for instance to refuse money, but

on the other hand it improves individuals' reasoning, in that formerly difficult abstract problems can be easily solved. These lines of research led to distinct (although not necessarily mutually exclusive) models for socially-driven behavioral changes. For instance, a popular theoretical framework interprets human behavior as a result of a conflict between cognition and emotion, with the cognitive system promoting self-interested choices, and the emotional system (triggered by the social context) operating against them. Other theories favor social norms and deontic heuristics in biasing human reasoning and encouraging choices that are sometimes in conflict with one's interest. Few studies attempted to disentangle between these (as well as other) models. As a consequence, although insightful results arise from specific domains/tasks, a comprehensive theoretical framework is still missing. Furthermore, studies employing neuroimaging techniques have begun to shed some light on the neural substrates involved in social behavior, implicating consistently (although not exclusively) portions of the limbic system, the insular and the prefrontal cortex. In this context, a challenge for present research lies not only in further mapping the brain structures implicated in social behavior, or in describing in detail the functional interaction between these structures, but in showing how the implicated networks relate to different theoretical models. This is Research Topic hosted by members of the Swiss National Center of Competence in Research "Affective Sciences – Emotions in Individual Behaviour and Social Processes". We collected contributions from the international community which extended the current knowledge about the psychological and neural structures underlying social behavior and decision making. In particular, we encouraged submissions from investigators arising from different domains (psychology, behavioral economics, affective sciences, etc.) implementing different techniques (behavior,

electrophysiology, neuroimaging, brain stimulations) on different populations (neurotypical adults, children, brain damaged or psychiatric patients, etc.). Animal studies are also included, as the data reported are of high comparative value. Finally, we also welcomed submissions of meta-analytical articles, mini-reviews and perspective papers which offer provocative and insightful interpretations of the recent literature in the field.

The peroxisome is an organelle with essential roles in lipid metabolism, maintenance of reactive oxygen species homeostasis, and anaplerotic replenishment of tricarboxylic acid cycle intermediates destined for mitochondria. Peroxisomes constitute a dynamic endomembrane system. The homeostatic state of this system is upheld via two pathways for assembling and maintaining the diverse peroxisomal compartments constituting it; the relative contribution of each pathway to preserving such system may vary in different organisms and under various physiological conditions. One pathway begins with the targeting of certain peroxisomal membrane proteins to an endoplasmic reticulum template and their exit from the template via pre-peroxisomal carriers; these carriers mature into metabolically active peroxisomes containing the entire complement of membrane and matrix proteins. Another pathway operates via growth and maturation of pre-existing peroxisomal precursors that do not originate from the endoplasmic reticulum; mature peroxisomes proliferate by undergoing fission. Recent studies have uncovered new roles for the peroxisomal endomembrane system in orchestrating important developmental decisions and defining organismal longevity. This Frontiers Special Topic Issue is focused on the advances in our understanding of how evolutionarily distant organisms coordinate the formation, maturation, proliferation, maintenance, inheritance and quality control of the peroxisomal endomembrane system and how peroxisomal

endomembranes communicate with other cellular compartments to orchestrate complex biological processes and various developmental programs from inside the cell.

The year 2014 was the hottest on record since we've begun collecting global temperature measurements in 1880. Even at its midway point, 2015 was already promising to take over this dubious record. As new thresholds are breached, acclaimed Radio New Zealand science writer Veronika Meduna explores our future in a warmer world. Beginning with lessons from our ancient geological past, this BWB Text draws on current observations and increasingly sophisticated climate models to describe possible end-of-century scenarios for New Zealand. Distorted ecosystems, extreme weather, new landscapes and adapted foods are just some of the likely changes that amount to a radically different future for our country.

The role of museums in enhancing well-being and improving health through social intervention is one of the foremost topics of importance in the museums sector today. With an aging population and emerging policies on the social responsibilities of museums, the sector is facing an unprecedented challenge in how to develop services to meet the needs of its communities in a more holistic and inclusive way. This book sets the scene for the future of museums where the health and well-being of communities is top of the agenda. The authors draw together existing research and best practice in the area of museum interventions in health and social care and offer a detailed overview of the multifarious outcomes of such interactions, including benefits and challenges. This timely book will be essential reading for museum professionals, particularly those involved in access and education, students of museums and heritage studies, as well as practitioners of arts in health, art therapists, care and community workers.

Sustainable horticulture is gaining increasing attention in the field of agriculture as demand for

the food production rises to the world community. Sustainable horticultural systems are based on ecological principles to farm, optimizes pest and disease management approaches through environmentally friendly and renewable strategies in production agriculture. It is a discipline that addresses current issues such as food security, water pollution, soil health, pest control, and biodiversity depletion. Novel, environmentally-friendly solutions are proposed based on integrated knowledge from sciences as diverse as agronomy, soil science, entomology, ecology, chemistry and food sciences. Sustainable horticulture interprets methods and processes in the farming system to the global level. For that, horticulturists use the system approach that involves studying components and interactions of a whole system to address scientific, economic and social issues. In that respect, sustainable horticulture is not a classical, narrow science. Instead of solving problems using the classical painkiller approach that treats only negative impacts, sustainable horticulture treats problem sources.

T-cells are an essential component of the immune system that provide protection against pathogen infections and cancer and are involved in the aetiology of numerous autoimmune and autoinflammatory pathologies. Their importance in disease, the relative ease to isolate, expand and manipulate them ex vivo have put T-cells at the forefront of basic and translational research in immunology. Decades of study have shed some light on the unique way T-cells integrate extrinsic environmental cues influencing an activation program triggered by interactions between peptide-MHC complexes and the antigen-recognition machinery constituted of clonally distributed T-cell receptors and their co-receptor CD4 or CD8. The manipulation of these molecular determinants in cellular systems or as recombinant proteins has considerably enhanced our ability to understand antigen-specific T-cell activation, to

monitor ongoing T-cell responses and to exploit T-cells for therapy. Even though these principles have given numerous insights in the biology of CD8+ T-cells that translate into promising therapeutic prospects, as illustrated by recent breakthroughs in cancer therapy, they have proven more challenging to apply to CD4+ T-cells. This Research Topic aims to provide a comprehensive view of the recent insights provided by the use of engineered antigen receptors and their ligands on T-cell activation and how they have been or could be harnessed to design efficient immunotherapies.

Hypoparathyroidism, a condition in which insufficient parathyroid hormone (PTH) is produced to maintain normocalcemia is associated with a variety of acute and chronic symptoms and complications due to hypocalcemia. Replacement therapy utilizing PTH has long been awaited, and this book is new and very timely as it coincides with the publication of results on the role of the PTH molecule in the pharmacological management of this disorder. This advance is sparking renewed interest in hypoparathyroidism, which is attributable to neck surgery in most cases and to inherited disorders in a minority. Hypoparathyroidism has been written by acknowledged experts in the field and provides essential, up-to-date information on the pathology, diagnosis, and treatment of the condition. It opens by addressing in detail the anatomy and physiology of the parathyroids and describing the epidemiology and clinical presentation of hypoparathyroidism. The full range of hypoparathyroid disorders are then discussed, including the various genetic forms, postoperative hypoparathyroidism, and other forms of acquired hypoparathyroidism. Individual chapters focus on refractory disease, the impact of the condition on bone, and the management of acute hypocalcemia. Both conventional treatment for hypoparathyroidism and the novel replacement therapy with PTH

peptides are then thoroughly examined. Pseudohypoparathyroidism is also extensively discussed, with information on the various forms, differential diagnosis, and genetic testing. This book will be of interest to all endocrinologists, and also to surgeons and internal medicine physicians.

Effective communication requires a common language, a truth that applies to science and mathematics as much as it does to culture and conversation. Standards and Standardization: Concepts, Methodologies, Tools, and Applications addresses the necessity of a common system of measurement in all technical communications and endeavors, in addition to the need for common rules and guidelines for regulating such enterprises. This multivolume reference will be of practical and theoretical significance to researchers, scientists, engineers, teachers, and students in a wide array of disciplines.

Organophosphorus chemistry is an important discipline within organic chemistry. Phosphorus compounds, such as phosphines, trialkyl phosphites, phosphine oxides (chalcogenides), phosphonates, phosphinates and >P(O)H species, etc., may be important starting materials or intermediates in syntheses. Let us mention the Wittig reaction and the related transformations, the Arbuzov- and the Pudovik reactions, the Kabachnik–Fields condensation, the Hirao reaction, the Mitsunobu reaction, etc. Other reactions, e.g., homogeneous catalytic transformations or C-C coupling reactions involve P-ligands in transition metal (Pt, Pd, etc.) complex catalysts. The synthesis of chiral organophosphorus compounds means a continuous challenge. Methods have been elaborated for the resolution of tertiary phosphine oxides and for stereoselective organophosphorus transformations. P-heterocyclic compounds, including aromatic and bridged derivatives, P-functionalized macrocycles, dendrimers and low

coordinated P-fragments, are also of interest. An important segment of organophosphorus chemistry is the pool of biologically-active compounds that are searched and used as drugs, or as plant-protecting agents. The natural analogue of P-compounds may also be mentioned. Many new phosphine oxides, phosphinates, phosphonates and phosphoric esters have been described, which may find application on a broad scale. Phase transfer catalysis, ionic liquids and detergents also have connections to phosphorus chemistry. Green chemical aspects of organophosphorus chemistry (e.g., microwave-assisted syntheses, solvent-free accomplishments, optimizations, and atom-efficient syntheses) represent a dynamically developing field. Last, but not least, theoretical approaches and computational chemistry are also a strong sub-discipline within organophosphorus chemistry.

This book constitutes the refereed proceedings of the 21st International Conference on Case-Based Reasoning Research and Development (ICCBR 2014) held in Cork, Ireland, in September 2014. The 35 revised full papers presented were carefully reviewed and selected from 49 submissions. The presentations cover a wide range of CBR topics of interest both to researchers and practitioners including case retrieval and adaptation, similarity assessment, case base maintenance, knowledge management, recommender systems, multiagent systems, textual CBR, and applications to healthcare and computer games.

The selected papers included in this proceedings on Malaysia-Japan Academic Scholar Conference (MJASC) 2013, are related to nano-science engineering, mechanical engineering, electrical and electronic engineering, computer science, information technology etc. This proceedings will be a source of research findings for Malaysia and Japan specifically, and other countries in general, especially among researchers, industry sectors and government

policy makers. It will be served as a resourceful reference and platform to reflect the significant of the Look East Policy outcomes and products.

Energy metabolism is central to life and altered energy expenditure (EE) is often cited as a central mechanism responsible for development of the obese phenotype. Resting EE, EE of physical activity, cold induced thermogenesis and thermic effect of feeding add to produce total EE but can also affect each other. It is thus very important that each component be well measured. Measuring energy expenditure by indirect calorimetry is extremely simple in theory but the practice if far more difficult. Taking into account temperature in small sized animals, measuring accurately the effect of activity on EE, correcting EE for body size body composition, age sex etc… add difficulties in producing reliable data. The goal of this Research Topic was to call for the practical experience of main investigators trained to practice calorimetry in order to get their feedback and the way they deal with the various and specific problems of humans and animal calorimetry. The goal is to share the questions/solutions experienced by the contributors to inititate a “guide of the good practices” that can be periodically updated and used by all those who are and will be interested in measuring energy metabolism from the 20g mouse to the human and large farm animals.

The papers in the "Hydrothermal Vent" e-book cover a range of microbiological research in deep and shallow hydrothermal environments, from high temperature “black smokers,” to diffuse flow habitats and episodically discharging subsurface fluids, to the hydrothermal plumes. Together they provide a snapshot of current research interests in a field that has evolved rapidly since the discovery of hydrothermal vents in 1977. Hydrothermally influenced microbial habitats and communities represent a wide spectrum of geological setting, chemical

in-situ regimes, and biotic communities; the classical examples of basalt-hosted black smoker chimneys at active mid-ocean spreading centers have been augmented by hydrothermally heated and chemically altered sediments, microbiota fueled by serpentinization reactions, and low-temperature vents with unusual menus of electron donors. Environmental gradients and niches provide habitats for unusual or unprecedented microorganisms and microbial ecosystems. The discovery of novel extremophiles underscores untapped microbial diversity in hydrothermal vent microbial communities. Different stages of hydrothermal activity, from early onset to peak activity, gradual decline, and persistence of cold and fossil vent sites, correspond to different colonization waves by microorganisms as well as megafauna. Perhaps no other field in microbiology is so intertwined with the geological and geochemical evolution of the oceans, and promises so many biochemical and physiological discoveries still to be made within the unexhausted richness of extreme microbial life.

This new Yearbook addresses the question of how policy, place, and organization are made to matter for a new research field to emerge. Bringing together leading historians, sociologists, and organizational researchers on science and technology, the volume answers this question by offering in-depth case studies and comparative perspectives on multiple research fields in their nascent stage, including molecular biology and materials science, nanotechnology, and synthetic biology. The Yearbook brings to bear the lessons of constructivist ethnography and the “practice turn” in Science and Technology Studies (STS) more broadly on the qualitative, comparative, and critical inquiry of new research fields. In doing so, it offers unprecedented insights into the complex interplay of national research policies, regional clusters, particular research institutions, and novel research practices in and for any emerging field of

(techno-)science. It systematically investigates national and regional differences, including the variable mobilization of such differences, and probes them for organizational topicality and policy relevance.

***WINNER OF A NAUTILUS 2017 SILVER MEDAL BOOK AWARD*** Adaptive Sensory Environments: An Introduction presents a cutting-edge methodology for adaptive sensory design by fostering an inter-disciplinary approach in which aspects of neuroscience, biophilia, captology, nanotechnology, kinetics, and sensemaking all play critical roles in helping adaptive architecture "tune" to occupants. Furthermore, the book illustrates how adaptive sensory environments transform and uplift quality of life in entirely new ways, by strategically unlocking the potential that technological innovations bring. By teaching scholars, researchers, practitioners, specialists, and consultants how to design architecture that guides what emerging interactive technology can do, it allows them to see deeper into an architectural design, to extend beyond interaction and, ultimately, to build environments that adapt by changing and growing with their occupants' immediate needs and long-term goals.

The discovery of the two inherited susceptibility genes BRCA1 and BRCA2 in the mid-1990s created the possibility of predictive genetic testing and led to the establishment of specific medical programmes for those at high risk of developing breast cancer in the UK, US and Europe. In the intervening fifteen years, the medical institutionalisation of these knowledge-practices and accompanying medical techniques

for assessing and managing risk have advanced at a rapid pace across multiple national and transnational arenas, whilst also themselves constituting a highly mobile and shifting terrain. This unique edited collection brings together cross-disciplinary social science research to present a broad global comparative understanding of the implications of BRCA gene research and medical practices. With a focus on time-economies that unfold locally, nationally and transnationally (including in Brazil, Canada, France, Germany, India, Italy, the UK and the USA), the essays in this volume facilitate a re-reading of concepts such as prevention, kinship and heredity, and together offer a unique, timely and comparative perspective on these developments. The book provides a coherent structure for examining the diversity of practices and discourses that surround developments linked to BRCA genetics, and to the evolving field of genetics more broadly. It will be of interest to students and scholars of anthropology, sociology, history of science, STS, public health and bioethics. Chapter 8 of this book is freely available as a downloadable Open Access PDF at www.tandfebooks.com/openaccess. It has been made available under a Creative Commons Attribution-Non Commercial-No Derivatives 3.0 license.

Solid biofuels, in different trading forms, constitute an integral component of the energy mix of almost all developed and developing countries. Either in the form of pellets, briquettes, chips, firewood, or even as raw feedstock, solid biofuels are used mainly in the heating and power sector. Numerous sustainability concerns, focusing on the

environmental, economic and technical aspects of solid biofuels exploitation, led to considerable advances in the recent years in this field. These developments mainly focus on the pre-treatment processes of the solid biomass to biofuels chain, the minimum requirements of the produced solid biofuels, as well as the efficiency and the environmental performance of their thermochemical conversion routes. This work aspires to provide the state of the art in the field of the exploitation of solid biofuels to present the main advances as well as the major challenges of this scientific fields. The topics presented in this book were examined and dealt with by the authors in the past few years, in numerous research projects and scientific publications. This book compiles all the assembled experience of the past few years, and aims to provide an overview of the solid biofuels exploitation field. Presents the latest standards and considerations on solid biofuels technical requirements; Contains numerous examples on applications in the field of solid biofuels thermochemical conversion, as well as the state of the art in this field; Includes sustainability aspects, including life cycle assessment aspects and financial concerns for the exploitation of solid biofuels.
1.The book “Child Development& Pedagogy” prepares for teaching examination for Paper I & II. 2.Guide is prepared on the basis of syllabus prescribed in CTET & other State TETs related examination 3.Divided in 2 Main Sections; Mathematics and Pedagogy giving Chapterwise coverage to the syllabus 4.Previous Years’ Solved Papers and 5 Practice sets are designed exactly on the latest pattern of the

examination 5.More than 1500 MCQs for thorough for practice. 6.Useful for CTET, UPTET, HTET, UTET, CGTET, and all other states TETs. Robert Stenberg once said, “There is no Recipe to be a Great Teacher, that’s what, is unique about them”. CTET provides you with an opportunity to make a mark as an educator while teaching in Central Government School. Prepare yourself for the exam with current edition of “Child Development and Pedagogy – Paper I & II” that has been developed based on the prescribed syllabus of CTET and other State TETs related examination. The book has been categorized under 22 chapters giving clear understanding of the concepts in Chapterwise manner. Each chapter is supplied with enough theories, illustrations and examples. With more than 1500 MCQs help candidates for the quick of the chapters. Practice part has been equally paid attention by providing Previous Years’ Questions asked in CTET & TET, Practice Questions in every chapter, along with the 5 Practice Sets exactly based on the latest pattern of the Examination. Also, Latest Solved Paper is given to know the exact Trend and Pattern of the paper. Housed with ample number of questions for practice, it gives robust study material useful for CTET, UPTET, HTET, UTET,CGTET, and all other states TETs. TOC Solved Paper I & II 2021 (January), Solved Paper I 2019 (December), Solved Paper II 2019 (December), Solved Paper 2019 (July), Solved Paper 2018 (December), CHILD DEVELOPMENT & PEDAGOGY: Concept of Development and its Relationship with Learning, Principles of Child Development, Influence of Heredity and Environment, Socialisation Process, Piaget,

Kohlberg and Vygotsky, Concept of Child-Centered and Progressive Education, Construct of Intelligence and Multi-Dimensional Intelligence, Language and Thought, Gender Issues in Social Construct, Individual Difference Among Learners, Evaluation of Learning, Evaluation of Achievement and Formation of Questions, Inclusive Education and Addressing Children from Diverse Backgrounds, Identifying and Addressing Disabled and Learning Disability Children, Identifying and Addressing the Talented, Creative and Specially Abled Learners, Thinking and Learning in Children, Basic Process of Teaching and Learning, Child as a Problem-Solver and as a Scientific Investigator, Alternative Conceptions of Learning in Children, Cognition and Emotion, Motivation and Learning, National Curriculum Framework 2005,Practice Sets (1-5).

This book presents 5 tutorial lectures given by leading researchers at the 13th edition of the International School on Formal Methods for the Design of Computer, Communication and Software Systems, SFM 2013, held in Bertinoro, Italy, in June 2013. SFM 2013 was devoted to dynamical systems and covered several topics including chaotic dynamics; information theory; systems biology; hybrid systems; quantum computing; and automata-based models and model checking.

With upwards of 4.5 million deaths worldwide each year, and more than one tenth of these occurring in those with no previously documented heart disease, sudden arrhythmic death (SAD) is both a major public health burden and a highly emotive issue for society at large. Recent years have witnessed a marked expansion in our

knowledge of the physiology underlying SAD, both in the context of hereditary and acquired cardiac disorders. Thanks largely to work in genetically modified animals, the growth in our understanding of mechanisms underlying arrhythmia in the hereditary channelopathies has been particularly marked. Our growing knowledge of the fundamental mechanisms underlying SAD has so far failed to spur substantial developments in clinical practice. Despite a large body of work in both humans and animals, it remains impossible to confidently identify those at high risk of SAD, making pre-emptive therapy a challenge. What is more, with the thankful exception of the implantable cardioverter-defibrillators and pharmacological agents in very specific situations, there has been depressingly little progress in finding new and effective therapies. This Research Topic aims to go some way towards bridging the gap between advances in basic science and the development and delivery of new therapies. It brings together original research contributions and review articles from key opinion leaders in the field, focusing on the direct clinical implications of the basic science research now and in the future

In the past, wildlife living in urban areas were ignored by wildlife professionals and urban planners because cities were perceived as places for people and not for wild animals. Paradoxically, though, many species of wildlife thrive in these built environments. Interactions between humans and wildlife are more frequent in urban areas than any other place on earth and these interactions impact human health, safety

and welfare in both positive and negative ways. Although urban wildlife control pest species, pollinate plants and are fun to watch, they also damage property, spread disease and even attack people and pets. In urban areas, the combination of dense human populations, buildings, impermeable surfaces, introduced vegetation, and high concentrations of food, water and pollution alter wildlife populations and communities in ways unseen in more natural environments. For these ecological and practical reasons, researchers and mangers have shown a growing interest in urban wildlife ecology and management. This growing interest in urban wildlife has inspired many studies on the subject that have yet to be synthesized in a cohesive narrative. Urban Wildlife: Theory and Practice fills this void by synthesizing the latest ecological and social knowledge in the subject area into an interdisciplinary and practical text. This volume provides a foundation for the future growth and understanding of urban wildlife ecology and management by: • Clearly defining th e concepts used to study and describe urban wildlife, • Offering a cohesive understanding of the coupled natural and social drivers that shape urban wildlife ecology, • Presenting the patterns and processes of wildlife response to an urbanizing world and explaining the mechanisms behind them and • Proposing means to create physical and social environments that are mutually beneficial for both humans and wildlife.

This book includes the post-conference proceedings of the 23rd RoboCup International Symposium, held in Sydney, NSW, Australia, in July 2019. The 38 full revised papers

and 14 invited papers presented in this book were carefully reviewed and selected from 74 submissions. This book highlights the approaches of champion teams from the competitions and documents the proceedings of the 23rd annual RoboCup International Symposium. Due to the complex research challenges set by the RoboCup initiative, the RoboCup International Symposium offers a unique perspective for exploring scientific and engineering principles underlying advanced robotic and AI systems.

The rapid development of new methods for immunological data collection – from multicolor flow cytometry, through single-cell imaging, to deep sequencing – presents us now, for the first time, with the ability to analyze and compare large amounts of immunological data in health, aging and disease. The exponential growth of these datasets, however, challenges the theoretical immunology community to develop methods for data organization and analysis. Furthermore, the need to test hypotheses regarding immune function, and generate predictions regarding the outcomes of medical interventions, necessitates the development of mathematical and computational models covering processes on multiple scales, from the genetic and molecular to the cellular and system scales. The last few decades have seen the development of methods for presentation and analysis of clonal repertoires (those of T and B lymphocytes) and phenotypic (surface-marker based) repertoires of all lymphocyte types, and for modeling the

intricate network of molecular and cellular interactions within the immune systems. This e-Book, which has first appeared as a ‘Frontiers in Immunology’ research topic, provides a comprehensive, online, open access snapshot of the current state of the art on immune system modeling and analysis.

There is a scarcity of detailed information regarding the ecophysiology of root systems and the way root system functioning is affected by both internal and external factors. Furthermore, global climate change is expected to increase the intensity of climate extremes, such as severe drought, heat waves and periods of heavy rainfall; in addition other stresses such as salinization of soils are increasing world-wide. Recently an increasing awareness has developed that understanding plant traits will play a major role in breeding of future crop plants. For example, there is increasing evidence that the traits of root systems are defined by the properties of individual roots. However, further knowledge on the functional importance of root segments and the molecular/physiological mechanisms underlying root system functioning and persistence is needed, and would specifically allow modifying (crop) root system functionality and efficiency in the future. Another major gap in knowledge is localized at the root-soil interface and in regard to the potential adaptive plasticity of root-rhizosphere interactions under abiotic stress and/or competition. It is currently unknown

whether adaptations in microbe communities occur, for example due to modified exudation rates, and what are the subsequent influences on nutrient mobilization and uptake. Furthermore, uncovering the mechanisms by which roots perceive neighboring roots may not only contribute to our understanding of plant developmental strategies, but also has important implications on the study of competitive interactions in natural communities, and in optimizing plant performance and resource use in agricultural and silvicultural systems. In this Research Topic, we aimed to provide an on-line, open-access snapshot of the current state of the art of the field of root ecology and physiology, with special focus on the translation of root structure to function, and how root systems are influenced by interplay with internal and external factors such as abiotic stress, microbes and plant-plant interaction. We welcomed original research papers, but reviews of specific topics, articles formulating opinions or describing cutting-edge methods were also gladly accepted.

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