

## Mathematics Paper 1 September 2013 Memorandum

One of the greatest mathematicians in the world, Michael Atiyah has earned numerous honors, including a Fields Medal, the mathematical equivalent of the Nobel Prize. While the focus of his work has been in the areas of algebraic geometry and topology, he has also participated in research with theoretical physicists. For the first time, these volumes bring together Atiyah's collected papers--both monographs and collaborative works-- including those dealing with mathematical education and current topics of research such as K-theory and gauge theory. The volumes are organized thematically. They will be of great interest to research mathematicians, theoretical physicists, and graduate students in these areas.

The International J. Mathematical Combinatorics is a fully refereed international journal, sponsored by the MADIS of Chinese Academy of Sciences and published in USA quarterly, which publishes original research papers and survey articles in all aspects of mathematical combinatorics, Smarandache multi-spaces, Smarandache geometries, non-Euclidean geometry, topology and their applications to other sciences.

This volume explores communication and its implications on interpretation, vagueness, multilingualism, and multiculturalism. It investigates cross-cultural perspectives with original methods, models, and arguments emphasizing national, EU, and international perspectives. Both traditional fields of investigations along with an emerging new field (Legal Visual Studies) are discussed. Communication addresses the necessity of an ongoing interaction between jurilinguists and legal professionals. This interaction requires persuasive, convincing, and acceptable reasons in justifying transparency, visual analyses, and dialogue with the relevant audience. The book is divided into five complementary sections: Professional Legal Communication; Legal Language in a Multilingual and Multicultural Context; Legal Communication in the Courtroom; Laws on Language and Language Rights; and Visualizing Legal Communication. The book shows the diversity in the understanding and practicing of legal communication and paves the way to an interdisciplinary and cross-cultural operation in our common understanding of legal communication. This book is suitable for advanced students in Linguistics and Law, and for academics and researchers working in the field of Language and Law and jurilinguists.

In Evidence, Politics, and Education Policy, political scientists Lorraine M. McDonnell and M. Stephen Weatherford provide an original analysis of evidence use in education policymaking to help scholars and advocates shape policy more effectively. The book shows how multiple types of evidence are combined as elected officials and their staffs work with researchers, advocates, policy entrepreneurs, and intermediary organizations to develop, create, and implement education policies. Evidence, Politics, and Education Policy offers an in-depth understanding of the political environment in which evidence is solicited and used. Two key case studies inform the book's findings. The primary case—a major, multimethod study—examines the development and early implementation of the Common Core State Standards at the national level and in four states: California, Indiana, Massachusetts, and Tennessee. A comparative case analyzes the evidence used in Congressional hearings over the twenty-year history of the Children's Health Insurance Program. Together, the two cases illustrate the conditions under which different types of evidence are used and, in particular, how federalism, the complexity of the policy problem, and the policy's maturity shape evidence use. McDonnell and Weatherford focus on three leverage points for strengthening the use of research evidence in education policy: integrating research findings with value-based policy ideas; designing policies with incentives for research use built into their rules and organizational structures; and training policy analysts to promote the use of research in policymaking venues.

The proceeding is a collection of research papers presented at the 2nd International Colloquium on Sports Science, Exercise, Engineering and Technology (ICoSSEET2015), a conference dedicated to address the challenges in the areas of sports science, exercise, sports engineering and technology including other areas of sports, thereby presenting a consolidated view to the interested researchers in the aforesaid fields. The goal of this conference was to bring together researchers and practitioners from academia and industry to focus on the scope of the conference and establishing new collaborations in these areas. The topics of interest are in mainly (1) Sports and Exercise Science (2) Sports Engineering and Technology Application (3) Sports Industry and Management.

A mathematical exploration of the popular card game SET Have you ever played the addictive card game SET? Have you ever wondered about the connections between games and mathematics? If the answer to either question is “yes,” then The Joy of SET is the book for you! The Joy of SET takes readers on a fascinating journey into this seemingly simple card game and reveals its surprisingly deep and diverse mathematical dimensions. Absolutely no mathematical background is necessary to enjoy this book—all you need is a sense of curiosity and adventure! The first book devoted to the mathematics of one of today's most popular card games, The Joy of SET will entertain and enlighten the game enthusiast in all of us.

This edited book brings together for the first time an international collection of work focused on two important aspects of any young child's life – learning mathematics and starting primary or elementary school. The chapters take a variety of perspectives, and integrate these two components in sometimes explicit and sometimes more subtle ways. The key issues and themes explored in this book are: the mathematical and other strengths that all participants in the transition to school bring to this period of a child's life; the opportunities provided by transition to school for young children's mathematics learning; the importance of partnerships among adults, and among adults and children, for effective school transitions and mathematics learning and teaching; the critical impact of expectations on their mathematics learning as children start school; the importance of providing children with meaningful, challenging and relevant mathematical experiences throughout transition to school; the entitlement of children and educators to experience assessment and instructional pedagogies that match the strengths of the learners and the teachers; the importance for the aspirations of children, families, communities, educators and educational organisations to be recognised as legitimate and key determinants of actions, experiences and successes in both transition to school and mathematics learning; and the belief that young children are powerful mathematics learners who can demonstrate this power as they start school. In each chapter, authors reflect on their work in the area of mathematics and transition to school, place that work within the overall context of research in these fields, predict the trajectory of this work in the future, and consider the implications of the work both theoretically and practically.

The aim of this paper is to analyze some of the relationships between oscillation theory for linear ordinary differential equations on the real line (shortly, ODE) and the geometry of complete Riemannian manifolds. With this motivation the authors prove some new results in both directions, ranging from oscillation and nonoscillation conditions for ODE's that improve on classical criteria, to estimates in the spectral theory of some geometric differential operator on Riemannian manifolds with related topological and geometric applications. To keep their investigation basically self-contained, the authors also collect some, more or less known, material which often appears in the literature in various forms and for which they give, in some instances, new proofs according to their specific point of view.

Trends in International Mathematics and Science Study (TIMSS) is one of the projects of the International Association for the Evaluation of Educational Achievement (IEA), located at Amsterdam, The Netherlands and Hamburg, Germany. IEA is an independent cooperative of national educational research institutions and governmental research agencies dedicated to improving education. TIMSS is conducted regularly for every four years to assess students' achievement in science and mathematics at both the fourth

and eighth grades. The project is dedicated to providing participating countries with information to improve teaching and learning in science and mathematics. This book is written especially for the interest of undergraduate students, postgraduate students, and educators of science education who wish to know more about the contributing factors to Grade 8 students' science achievement in TIMSS. This book is also resourceful for individuals who are involved, directly or indirectly, in the administration and implementation of TIMSS at the national, state, district, and school levels. This book consists of seven chapters. The first chapter gives a brief introduction to TIMSS which includes the TIMSS curriculum model and TIMSS science assessment frameworks. The subsequent chapters compare the contribution of various factors, i.e., home environment support, school resources, school climate, teacher preparation, and classroom instructions on Malaysian and Singaporean Grade 8 students' science achievement in TIMSS 2011. Last but not least, recommendations on ways to improve Malaysian Grade 8 students' science achievement in the forthcoming TIMSS are suggested based on the experiences of the Singaporean education system.

This book is a collaborative product of an official project approved by the East-Asian Association for Science Education (EASE), one of the most important professional societies of science education in Asia. This EASE book is compiled with a unique approach. It consists of well-structured four sections: (A)The Historical Development of Science Education in East Asia, (B)The Achievements of Science Education Research in East Asia, (C)Science Teacher Training in East Asia, and (D)Some Challenges to Research in Science Education in East Asia. Its fifteen chapters are co-authored/collaborated by renowned scholars from regions of East Asia. The book successfully integrated and consolidated the research, findings, curricular developments, and science teaching practices that have shaped ongoing educational agenda and student learning outcome in an unprecedented approach. Six Regional Coordinators from Mainland China, Hong Kong, Japan, Korea, and Taiwan worked together with Editors and more than fifty science educators to assure the book project adequately reflects the trends and practices in this region. The six Regional Coordinators are: (1)Prof. Weiping HU, Shaanxi Normal University, (2)Prof. Winnie SO Wing Mui, The Education University of Hong Kong, (3)Prof. Masakata OGAWA, Tokyo University of Science, (4)Prof. Jinwoong SONG, Seoul National University, (5)Prof. Huann-shyang LIN, National Sun Yat-sen University, (6)Prof. Chi-jui LIEN, National Taipei University of Education. This book intends not only to serve as references, but also a complement of existing perspectives from western countries. Insights gained from the integration and consolidation of East-Asian developmental trends and perspectives would allow science educators, teachers, and policy makers make wise decision for future advancements for their own countries/regions. 1. Why We Study the History of Science Education in East Asia: A Comparison of the Emergence of Science Education in China and Japan. 2. The Advent of Science Education for All: A Policy Review across East-Asian Regions. 3. Trend and Development of School Science Education in Taiwan, Hong Kong, and Korea. 4. National/Regional Systems of Research Training in Science Education: The Experiences in Japan and Hong Kong. 5. Science Education Research Trends in East Asian Areas: A Quantitative Analysis in Selected Journals. 6. Current Trends of Science Education in East Asia (1995-2014): With a Focus on Local Academic Associations, Journal Papers, and Key Issues of Science Education in China Mainland, Japan, Korea, and Taiwan. 7. Diversity Dilemmas of Science Education in East Asia. 8. A Comparison of Elementary School Science Textbooks in East Asia. 9. Primary School Science Teacher Training in East-Asia: In the Continuous Reforming for the Quality Assurance. 10. Pre-service Education of High School Science Teachers. 11. Science Education Reform and the Professional Development of Science Teachers in East Asian Regions. 12. Affective Aspects of Science Education in East Asia Regions. 13. Science Learning in Informal Environments in East Asia: Focusing on Science Museums/Centers. 14. Introducing Modern Science and High Technology in Schools. 15. Government Policy in Developing a STEM Curriculum: The Case of the High-Scope Program in Taiwan.

Professor Atiyah is one of the greatest living mathematicians and is renowned in the mathematical world. He is a recipient of the Fields Medal, the mathematical equivalent of the Nobel Prize, and is still actively involved in the mathematics community. His huge number of published papers, focusing on the areas of algebraic geometry and topology, have here been collected into seven volumes, with the first five volumes divided thematically and the sixth and seventh arranged by date. This seventh volume in Michael Atiyah's Collected Works contains a selection of his publications between 2002 and 2013, including his work on skyrmions; K-theory and cohomology; geometric models of matter; curvature, cones and characteristic numbers; and reflections on the work of Riemann, Einstein and Bott.

Primary Mathematics provides a comprehensive introduction to teaching and learning mathematics in today's classrooms. Drawing links to the Australian Curriculum, this book covers the core learning areas of measurement, space and geometry, early number concepts, data and statistics, chance and probability, and patterns and algebra. At the centre of this book is the belief that ICT can be a powerful tool for enhancing student learning. Although many classrooms have been resourced with computers, interactive whiteboards and mobile technology, teachers need to be able to transform these technological tools into meaningful teaching and learning experiences. This book explores the ways in which technology can be integrated into the mathematics classroom. The book also explores issues around student diversity, assessment 'for', 'of' and 'as' learning, and teaching in rural and remote areas. Primary Mathematics is an indispensable resource for pre- and in-service teachers alike.

This book is a printed edition of the Special Issue "Decomposability of Tensors" that was published in Mathematics World Yearbook of Education 2017Assessment InequalitiesRoutledge

This latest volume in the World Yearbook of Education series examines the relationship between assessment systems and efforts to advance equity in education at a time of growing inequalities. It focuses on the political motives behind the expansion of an assessment industry, the associated expansion of an SEN industry and a growth in

consequential accountability systems. Split into three key sections, the first part is concerned with the assessment industry, and considers the purpose and function of assessment in policy and politics and the political context in which particular assessment practices have emerged. Part II of the book, on assessing deviance, explores those assessment and identification practices that seek to classify different categories of learners, including children with Limited English Proficiency, with special needs and disabilities and with behavioural problems. The final part of the book considers the consequences of assessment and the possibility of fairer and more equitable alternatives, examining the production of inequalities within assessment in relation to race, class, gender and disability. Discussing in detail the complex historical intersections of assessment and educational equity with particular attention to the implications for marginalised populations of students and their families, this volume seeks to provide reframings and reconceptualisations of assessment and identification by offering new insights into economic and cultural trends influencing them. Co-edited by two internationally renowned scholars, Julie Allan and Alfredo J. Artiles, *World Yearbook of Education 2017* will be a valuable resource for researchers, graduates and policy makers who are interested in the economic trends of global education assessment.

Across the world STEM (learning and work in Science, Technology, Engineering and Mathematics) has taken central importance in education and the economy in a way that few other disciplines have. STEM competence has become seen as key to higher productivity, technological adaptation and research-based innovation. No area of educational provision has a greater current importance than the STEM disciplines yet there is a surprising dearth of comprehensive and world-wide information about STEM policy, participation, programs and practice. *The Age of STEM* is a state of the art survey of the global trends and major country initiatives in STEM. It gives an international overview of issues such as: STEM strategy and coordination curricula, teaching and assessment women in STEM indigenous students research training STEM in the graduate labour markets STEM breadth and STEM depth The individual chapters give comparative international analysis as well as a global overview, particularly focusing on the growing number of policies and practices in mobilising and developing talent in the STEM fields. The book will be of particular interest to anyone involved in educational policy, those in education management and leaders in both schooling and tertiary education. It will have a wider resonance among practitioners in the STEM disciplines, particularly at university level, and for those interested in contemporary public policy.

Software plays a critical role in today's global information economy. It runs the computers, networks, and devices that enable countless products and services. Software varies in size from vast enterprise and communications systems like the enormous enterprise resource planning system from SAP to the tiny app Angry Birds. This book offers a profile of the software industry and the companies in the industry. It describes the primary products and services produced; reviews its history; explains how the industry is structured; discusses its economics and competitive environment; and examines important trends and issues including globalization, workforce, regulation, and the emergence of new software business models. Software runs the computers and networks that support the flow of information in the global economy, and this book provides a real look at the intricacies of this industry.

This first volume of OECD's multidimensional review presents an initial assessment and finds that Uruguay has benefited from a favourable economic context over the last decade, but faces significant challenges.

Papers on Smarandachely edge 2-labeling, Jelly fish graph, Vertex graceful graphs, vertex graceful labeling, caterpillar, actinia graphs, Smarandachely vertex m-labeling, regions Smarandachely semirelib M-graph, mean graph, mean labeling, etc.

"An elegant and amusing account" of how gambling has been reshaped by the application of science and revealed the truth behind a lucky bet (*Wall Street Journal*). For the past 500 years, gamblers-led by mathematicians and scientists-have been trying to figure out how to pull the rug out from under Lady Luck. In *The Perfect Bet*, mathematician and award-winning writer Adam Kucharski tells the astonishing story of how the experts have succeeded, revolutionizing mathematics and science in the process. The house can seem unbeatable. Kucharski shows us just why it isn't. Even better, he demonstrates how the search for the perfect bet has been crucial for the scientific pursuit of a better world. Promoting democracy has long been a priority of Western foreign policy. In practice, however, international attempts to expand representative forms of government have been inconsistent and are often perceived in the West to have been failures. The states of Central Asia, in particular, seem to be "democracy resistant," and their governments have continued to support various forms of authoritarianism in the decades following the Soviet Union's collapse. In *Democracy in Central Asia*, Mariya Omelicheva examines the beliefs and values underlying foreign policies of the major global powers -- the United States, the European Union, Russia, and China -- in order to understand their efforts to influence political change in Kazakhstan, Kyrgyzstan, and Uzbekistan. Omelicheva has traveled extensively in the region, collecting data from focus groups and public opinion surveys. She draws on the results of her fieldwork as well as on official documents and statements of democracy-promoting nations in order to present a provocative new analysis. Her study reveals that the governments and citizens of Central Asia have developed their own views on democracy supported by the Russian and Chinese models rather than by Western examples. The vast majority of previous scholarly work on this subject has focused on the strategies of democratization pursued by one agent such as the United States or the European Union. Omelicheva shifts the focus from democracy promoters' methods to their message and expands the scope of existing analysis to include multiple sources of influence. Her fresh approach illuminates the full complexity of both global and regional notions of good governance and confirms the importance of social-psychological and language-based perspectives in understanding the obstacles to expanding egalitarianism.

Providing a clear and systematic description of droplets and spray dynamic models, this book maximises reader insight into the underlying physics of the processes involved, outlines the development of new physical and mathematical models and broadens understanding of interactions between the complex physical processes which take place in sprays. Complementing approaches based on the direct application of computational fluid dynamics (CFD), *Droplets and Sprays* treats both theoretical and practical aspects of internal combustion engine process such as the direct injection of liquid fuel, subcritical heating and evaporation. Including case studies that illustrate the approaches relevance to automotive applications, it is also anticipated that the described models can find use in other areas such as in medicine and environmental science.

Primary maths is stereotypically loved by a few hairy oddballs, tolerated by most sane primary practitioners; loathed by many. With the right approach, however; the right mindset and sense of the impossible being achievable, maths can be moulded into the diamond in the rough of the primary curriculum. Enter Nick Tiley-Nunn: Britain's most imaginative, most exciting primary maths specialist. Over years of practice he has generated ideas about the teaching of maths that are so distinct, so far out and so utterly brilliant that any primary teacher struggling to grasp the nettle of teaching long division will emerge from communing with his ideas not just with some clichéd sense that 'maths can be fun', but that it can be brilliant, life-enhancing and truly hilarious. This book presents ideas for primary maths teaching so wildly creative and so full of the joy of life that any classroom of kids will be grateful you read it.

This book engages a select group of scholars from across the ideological spectrum to examine particular education reform efforts of recent years that have not succeeded and offer lessons for school and system improvement that can be learned from them.

Our everyday lives are practically unthinkable without optimization. We constantly try to minimize our effort and to maximize the reward or progress achieved. Many real-world and industrial problems arising in engineering, economics, medicine and other domains can be formulated as optimization tasks. This volume presents a comprehensive collection of extended contributions from the 2017 Workshop on Computational Optimization. Presenting recent advances in computational optimization, it addresses important concrete applications, e.g. the modeling of physical processes, wildfire modeling, modeling processes in chemical engineering, workforce planning, wireless access network topology, parameter settings for controlling various processes, berth allocation, identification of homogeneous domains, and quantum computing. The book shows how to develop algorithms for them based on new intelligent methods like evolutionary computations, ant colony optimization, constrain programming and others.

The general theme of MEDICON 2013 is "Research and Development of Technology for Sustainable Healthcare". This decade is being characterized by the appearance and use of emergent technologies under development. This situation has produced a tremendous impact on Medicine and Biology from which it is expected an unparalleled evolution in these disciplines towards novel concept and practices. The consequence will be a significant improvement in health care and well-fare, i.e. the shift from a reactive medicine to a preventive medicine. This shift implies that the citizen will play an important role in the healthcare delivery process, what requires a comprehensive and personalized assistance. In this context, society will meet emerging media, incorporated to all objects, capable of providing a seamless, adaptive, anticipatory, unobtrusive and pervasive assistance. The challenge will be to remove current barriers related to the lack of knowledge required to produce new opportunities for all the society, while new paradigms are created for this inclusive society to be socially and economically sustainable, and respectful with the environment. In this way, these proceedings focus on the convergence of biomedical engineering topics ranging from formalized theory through experimental science and technological development to practical clinical applications.

Printed Edition of the Special Issue Published in Entropy

How does mathematics impact everyday events? The purpose of this book is to show a range of examples where mathematics can be seen at work in everyday life. From money (APR, mortgage repayments, personal finance), simple first and second order ODEs, sport and games (tennis, rugby, athletics, darts, tournament design, soccer, snooker), business (stock control, linear programming, check digits, promotion policies, investment), the social sciences (voting methods, Simpson's Paradox, drug testing, measurements of inequality) to TV game shows and even gambling (lotteries, roulette, poker, horse racing), the mathematics behind commonplace events is explored. Fully worked examples illustrate the ideas discussed and each chapter ends with a collection of exercises. Everyday Mathematics supports other first year modules by giving students extra practice in working with calculus, linear algebra, geometry, trigonometry and probability. Secondary/high school level mathematics is all that is required for students to understand the material. Those students whose degree course includes writing an extended mathematical essay will find many suitable topics here, with pointers to extend and develop the material.

The book comprises papers presented at the 7th International Conference on University Learning and Teaching (InCULT) 2014, which was hosted by the Asian Centre for Research on University Learning and Teaching (ACRULeT) located at the Faculty of Education, Universiti Teknologi MARA, Shah Alam, Malaysia. It was co-hosted by the University of Hertfordshire, UK; the University of South Australia; the University of Ohio, USA; Taylor's University, Malaysia and the Training Academy for Higher Education (AKEPT), Ministry of Education, Malaysia. A total of 165 papers were presented by speakers from around the world based on the theme "Educate to Innovate in the 21st Century." The papers in this timely book cover the latest developments, issues and concerns in the field of teaching and learning and provide a valuable reference resource on university teaching and learning for lecturers, educators, researchers and policy makers.

The 2013/2014 Education for All Global Monitoring Report shows that a lack of attention to education quality and a failure to reach the marginalized have contributed to a learning crisis that needs urgent attention. Worldwide, 250 million children many of them from disadvantaged backgrounds are not learning the basics. *Teaching and Learning: Achieving Quality for All* describes how policy-makers can support and sustain a quality education system for all children, regardless of background, by providing the best teachers. The Report also documents global progress in achieving Education for All goals and provides lessons for setting a new education agenda post-2015. In addition, the Report identifies that insufficient financing is hindering advances in

education.

With chapter sequencing following the new Curriculum, this book supports trainee Primary school teachers to make use of the opportunities presented in the new National Curriculum for effective and engaging Mathematics teaching. Covering all of the areas of the new Curriculum for primary mathematics and offering insight into effective teaching, this book helps students connect what they need to teach with how it can be taught. Exploring opportunities in the new curriculum for creative and imaginative teaching, it shows readers how to capitalize on opportunities to develop children's reasoning and problem solving skills. It explores how to make links between mathematics and children's lived experiences to enhance their learning and enables trainees to develop an ability to plan with discernment, making the most of existing thinking and research as well as building confidence in adapting and customizing ideas. Includes the full National Curriculum Programme of Study for Maths, key stages 1 and 2 as a useful reference for trainee teachers. Other books in this series include: Primary Science for Trainee Teachers and Primary English for Trainee Teachers

In January 1976, Raymond Barre, the first President of The Geneva Association, and Orio Giarini, its first Secretary General, founded The Geneva Papers on Risk and Insurance with the main goal of supporting and encouraging research in the economics of risk and insurance. At that time, research in the field of insurance was still embryonic and insurance was regarded as peripheral social activity. When sustained economic growth gained traction, the function of insurance gradually emerged as a key contributor to economic development. By integrating uncertainty into economic theory and benefiting from the progress of both financial economics and decision theory, research developed further in the field of insurance economics and risk management, and is now prolific. The Geneva Papers on Risk and Insurance undeniably contributed to this evolution and its impact on research in insurance has largely exceeded what its two founding members could have expected. This volume is a special collection of papers celebrating 40 Years of The Geneva Papers on Risk and Insurance. The collection looks back at the storied history of The Geneva Papers on Risk and Insurance and features papers from some of the esteemed authors who have contributed to the journal in its lifetime. This collection of papers highlights just a few of the many themes addressed in the papers published by the journal since it was created. Nevertheless, the selection exemplifies the richness and variety of topics the field of insurance covers.

The authors study the Cauchy problem for the sine-Gordon equation in the semiclassical limit with pure-impulse initial data of sufficient strength to generate both high-frequency rotational motion near the peak of the impulse profile and also high-frequency librational motion in the tails. They show that for small times independent of the semiclassical scaling parameter, both types of motion are accurately described by explicit formulae involving elliptic functions. These formulae demonstrate consistency with predictions of Whitham's formal modulation theory in both the hyperbolic (modulationally stable) and elliptic (modulationally unstable) cases.

The two-volume set LNCS 10777 and 10778 constitutes revised selected papers from the 12th International Conference on Parallel Processing and Applied Mathematics, PPAM 2017, held in Lublin, Poland, in September 2017. The 49 regular papers presented in this volume were selected from 98 submissions. For the workshops and special sessions, that were held as integral parts of the PPAM 2017 conference, a total of 51 papers was accepted from 75 submissions. The papers were organized in topical sections named as follows: Part I: numerical algorithms and parallel scientific computing; particle methods in simulations; task-based paradigm of parallel computing; GPU computing; parallel non-numerical algorithms; performance evaluation of parallel algorithms and applications; environments and frameworks for parallel/distributed/cloud computing; applications of parallel computing; soft computing with applications; and special session on parallel matrix factorizations. Part II: workshop on models, algorithms and methodologies for hybrid parallelism in new HPC systems; workshop power and energy aspects of computations (PEAC 2017); workshop on scheduling for parallel computing (SPC 2017); workshop on language-based parallel programming models (WLPP 2017); workshop on PGAS programming; minisymposium on HPC applications in physical sciences; minisymposium on high performance computing interval methods; workshop on complex collective systems.

The MATSim (Multi-Agent Transport Simulation) software project was started around 2006 with the goal of generating traffic and congestion patterns by following individual synthetic travelers through their daily or weekly activity programme. It has since then evolved from a collection of stand-alone C++ programs to an integrated Java-based framework which is publicly hosted, open-source available, automatically regression tested. It is currently used by about 40 groups throughout the world. This book takes stock of the current status. The first part of the book gives an introduction to the most important concepts, with the intention of enabling a potential user to set up and run basic simulations. The second part of the book describes how the basic functionality can be extended, for example by adding schedule-based public transit, electric or autonomous cars, paratransit, or within-day replanning. For each extension, the text provides pointers to the additional documentation and to the code base. It is also discussed how people with appropriate Java programming skills can write their own extensions, and plug them into the MATSim core. The project has started from the basic idea that traffic is a consequence of human behavior, and thus humans and their behavior should be the starting point of all modelling, and with the intuition that when simulations with 100 million particles are possible in computational physics, then behavior-oriented simulations with 10 million travelers should be possible in travel behavior research. The initial implementations thus combined concepts from computational physics and complex adaptive systems with concepts from travel behavior research. The third part of the book looks at theoretical concepts that are able to describe important aspects of the simulation system; for example, under certain conditions the code becomes a Monte Carlo engine sampling from a discrete choice model. Another important aspect is the interpretation of the MATSim score as utility in the microeconomic sense, opening up a connection to benefit cost analysis. Finally, the book collects use cases as they have been undertaken with MATSim. All current users of MATSim were invited to submit their work, and many followed with sometimes crisp and short and sometimes longer contributions, always with pointers to additional references. We hope that the book will become an invitation to explore, to build and to extend agent-based modeling of travel behavior from the stable and well tested core of MATSim documented here.

This survey provides a brief and selective overview of research in the philosophy of mathematics education. It asks what makes up the philosophy of mathematics education, what it means, what questions it asks and answers, and what is its overall importance and use? It provides overviews of critical mathematics education, and the most relevant modern movements in the philosophy of mathematics. A case study is provided of an emerging research tradition in one country. This is the Hermeneutic strand of research in the philosophy of mathematics education in Brazil. This illustrates one orientation towards research inquiry in the philosophy of mathematics education. It is part of a broader practice of 'philosophical archaeology': the uncovering of hidden assumptions and buried ideologies within the concepts and methods of research and practice in mathematics education. An extensive bibliography is also included.

Given a prime  $p$ , a group  $G$  is called residually  $p$  if the intersection of its  $p$ -power index normal subgroups is trivial. A group  $G$  is called virtually residually  $p$  if it has a finite index subgroup which is residually  $p$ . It is well-known that finitely generated linear groups over fields of characteristic zero are virtually residually  $p$  for all  $p$  but finitely many  $p$ . In particular, fundamental groups of hyperbolic  $n$ -manifolds are virtually residually  $p$ .

is also well-known that fundamental groups of  $n$ -manifolds are residually finite. In this paper the authors prove a common generalization of these results: every  $n$ -manifold group is virtually residually  $p$  for all but finitely many  $p$ . This gives evidence for the conjecture (Thurston) that fundamental groups of  $n$ -manifolds are linear groups.

Help all students become high-achieving mathematics learners. Gain a strong understanding of mathematics culture, and learn necessary best practices to fully align curriculum and instruction with the CCSS for mathematics. You'll explore the factors that have traditionally limited mathematics achievement for students and discover practical strategies for creating an environment that supports mathematics learning and instruction.

The Langlands Programme is one of the most important areas in modern pure mathematics. The importance of this volume lies in its potential to recast many aspects of the programme in an entirely new context. For example, the morphisms in the monomial category of a locally  $p$ -adic Lie group have a distributional description, due to Bruhat in his thesis. Admissible representations in the programme are often treated via convolution algebras of distributions and representations of Hecke algebras. The monomial embedding, introduced in this book, elegantly fits together these two uses of distribution theory. The author follows up this application by giving the monomial category treatment of the Bernstein Centre, classified by Deligne-Bernstein-Zelevinsky. This book gives a new categorical setting in which to approach well-known topics. Therefore, the context used to explain examples is often the more generally accessible case of representations of finite general linear groups. For example, Galois base-change and epsilon factors for locally  $p$ -adic Lie groups are illustrated by the analogous Shintani descent and Kondo-Gauss sums, respectively. General linear groups of local fields are emphasized. However, since the philosophy of this book is essentially that of homotopy theory and algebraic topology, it includes a short appendix showing how the buildings of Bruhat-Tits, sufficient for the general linear group, may be generalised to the tom Dieck spaces (now known as the Baum-Connes spaces) when  $G$  is a locally  $p$ -adic Lie group. The purpose of this monograph is to describe a functorial embedding of the category of admissible  $k$ -representations of a locally profinite topological group  $G$  into the derived category of the additive category of the admissible  $k$ -monomial module category. Experts in the Langlands Programme may be interested to learn that when  $G$  is a locally  $p$ -adic Lie group, the monomial category is closely related to the category of topological modules over a sort of enlarged Hecke algebra with generators corresponding to characters on compact open modulo the centre subgroups of  $G$ . Having set up this functorial embedding, how the ingredients of the celebrated Langlands Programme adapt to the context of the derived monomial module category is examined. These include automorphic representations, epsilon factors and L-functions, modular forms, Weil-Deligne representations, Galois base change and Hecke operators.

Speculative realism is one of the most talked-about movements in recent Continental philosophy. It has been discussed widely amongst the younger generation of Continental philosophers seeking new philosophical approaches and promises to form the cornerstone of future debates in the field. This book introduces the contexts out of which speculative realism has emerged and provides an overview of the major contributors and latest developments. It guides the reader through the important questions asked by realism (what can I know? what is reality?), examining philosophy's perennial questions in new ways. The book begins with the speculative realist's critique of 'correlationism', the view that we can never reach what is real beneath our language systems, our means for perception, or our finite manner of being-in-the-world. It goes on to critically review the work of the movement's most important thinkers, including Quentin Meillassoux, Ray Brassier, and Graham Harman, but also other important writers such as Jane Bennett and Catherine Malabou whose writings delineate alternative approaches to the real. It interrogates the crucial questions these thinkers have raised and concludes with a look toward the future of speculative realism, especially as it relates to the reality of time.

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