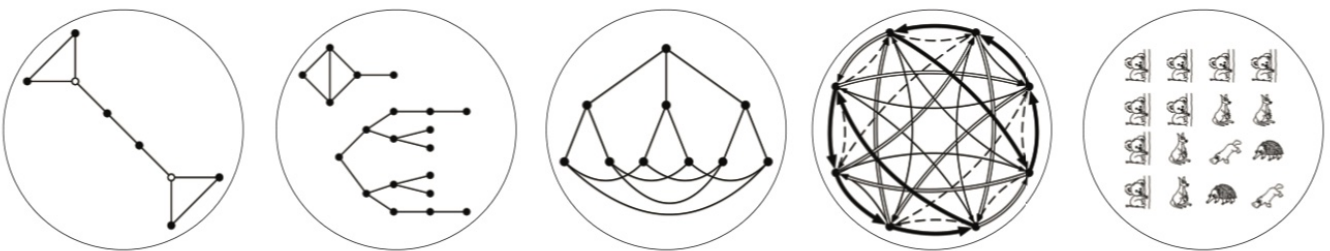


Godsil75

A celebration of Chris Godsil's 75th birthday

University of Waterloo

March 15-17, 2024



Welcome

Dear Workshop Participants,

Welcome to Godsil75: a virtual workshop celebrating Chris Godsil's life, work and birthday.

Chris Godsil's imprint on mathematics goes beyond algebraic combinatorics to merge theory and application, emerging research areas and well-developed mathematical tools. Chris Godsil is a research leader in discrete mathematics and he continues to be influential in a wide range of mathematical sub-disciplines and communities around the world. He has long been a prominent member of the Canadian combinatorial community, working first at Simon Fraser University and then playing a leadership role in the Department of Combinatorics and Optimization at the University of Waterloo; as a result, Chris Godsil has influenced multiple generations of mathematicians in Canada and abroad.

The goal of this workshop is not just to honour Chris Godsil's contributions and his impact on mathematics, but also to bring together researchers in discrete mathematics whose work has been influenced by Chris Godsil. We invite researchers in combinatorics, matrix theory, and quantum information theory from all over the world to join us, and schedule sessions to accommodate a range of time zones.

We thank the Department of Combinatorics and Optimization, University of Waterloo (especially Professor Swamy, Carol and Gen) for logistical support.

Yours sincerely,

Soffía Árnadóttir, Danmarks Tekniske Universitet
Ada Chan, York University
Qiuting Chen, Universität Paderborn
Sabrina Lato, Umeå Universitet
Mariia Sobchuk, University of Waterloo
Christino Tamon, Clarkson University

Schedule

		Saturday March 16 (morning)		Sunday March 17 (morning)	
		9 a.m.	Wilfried Imrich (online)	10 a.m.	Gabriel Coutinho (online)
		10 a.m.	Harmony Zhan (MC 6029)	10:45 a.m.	Aleksandar Jurišić (MC 6029)
Friday March 15 (afternoon)		Saturday March 16 (afternoon)		11:30 a.m.	Chris Godsil (MC 6029)
3:30 p.m.	Chris Godsil Tutte Colloquium (MC 5501)	1 p.m.	Karen Meagher (online)		
4:30 p.m.	Reception (MC 5511)	2 p.m.	Bojan Mohar (online)		
Friday March 15 (evening)		Saturday March 16 (evening)			
7 p.m.	Brendan McKay (online)	8 p.m.	William J. Martin (online)		
8 p.m.	Xiaohong Zhang (MC 6029)	8:45 p.m.	Gordon Royle (online)		

All talks, except for the Tutte Colloquium, will be broadcasted over zoom.

- Zoom:

<https://uwaterloo.zoom.us/j/91621213322?pwd=bTRsalZEWElcHIIZDZsMEMvdWhvQT09>

Meeting ID: 916 2121 3322

Passcode: 806921

This zoom link will be available from 6 p.m. March 15 to 5 p.m. March 17. Participants are welcome to use this link for discussions.

- In-person participation: [MC 6029, University of Waterloo](#)

Talks

Tutte Colloquium

Speaker: Chris Godsil, University of Waterloo

Title: Graph Theory and Quantum Computing

Abstract:

I will present some the work I have done with my group during my time (37 years +) in the C&O department, and try to explain how perfectly innocent questions in graph theory lead me to work on questions arising in quantum computing.



There will be a reception following the Tutte Colloquium in MC 5511.

March 15 (evening)

Session chairs: Maxwell Levit and Mariia Sobchuk

Speaker: Brendan McKay, Australian National University

Title: Some Exercises in Combinatorial Generation

Abstract:

Generation of exhaustive lists of combinatorial objects such as graphs has been a passion of mine since Chris and I started working on the spectral theory of graphs as students in 1975. In this talk I'll discuss some random examples, which will probably include graphs that are extremal under the property of having no cycles of some specified lengths (joint with Narjess Afzaly), and balanced incomplete block designs (joint with Andrei V. Ivanov and Patric Ostergard).

Speaker: Xiaohong Zhang, Université de Montréal

Title: Continuous Quantum Walks

Abstract:

Let M be a Hermitian matrix associated to a graph X on n vertices. For any time $t \geq 0$, the transition matrix of the continuous quantum walk on X relative to M at time t is given by $U(t) = e^{itM}$. Let D be a density matrix (positive semidefinite of trace 1) of size n . The state of the walk at time t with initial state D is given by $D(t) = U(t)DU(-t)$. For two given states (density matrices) D_1 and D_2 , if there is a time t such that $D_1(t) = D_2$, then we say there is perfect state transfer from D_1 to D_2 at time t . If the above holds for $D_2 = D_1$, then we say the walk is periodic at D_1 at time t .

A lot of research has been done for the case where D represents a vertex state. In this talk, we will consider a more general state D and give a characterization of perfect state transfer when the states are rational, for example when D is a scaled Laplacian matrix of some graph. We also consider state transfer on oriented graphs, discussing some of its different state transfer properties. We will mention some algebraic and spectral graph theory results motivated by quantum walks as well.

March 16 (morning)

Session chairs: Tina (Qiuting) Chen and Christopher van Bommel

Speaker: Wilfried Imrich, Montanuniversität Leoben

Title: Hierarchical Product Graphs

Abstract:

In 1974 Schwenk introduced a binary operation of graphs to study their spectra. This operation was generalized by Godsil and McKay in 1978 for the investigation of spectra of trees. In 2009 it was rediscovered and generalized by Barrière, Comella et al. in 2009, under the names hierarchical and generalized hierarchical product.

The products are not commutative and associative only under certain conditions. For the associative case unique prime factorization with respect to both products was claimed in 2017 by Anderson et al. for finite connected graphs, but the proof is not correct. We correct the result and extend it to connected rayless infinite graphs.

This is joint work with Rafał Kalinowski and Monika Piłśniak.

Speaker: Harmony (Hanmeng) Zhan, Worcester Polytechnic Institute

Title: From Continuous to Discrete

Abstract:

Chris has found algebraic graph theoretic approaches to many problems in quantum computing. This talk will discuss those that I have been luckily involved in — from the very first project in continuous quantum walks when I began as his student, to the ongoing problems on discrete quantum walks that we explore in our book.

March 16 (afternoon)

Session chair: Sabrina Lato

Speaker: Karen Meagher, University of Regina

Title: Algebraic Approaches to Erdos-Ko-Rado Theorem: an Afterword

Abstract:

At the Godsil 65 conference I ended my talk with the prediction that Chris and I were going to write book. It seemed optimistic at the time, but this actually happened and it was published in 2016. The book is based on several examples where a version of the Erdos-Ko-Rado theorem holds and can be proven using algebraic tools. In this talk I will outline many of the new directions this work has taken.

Speaker: Bojan Mohar, Simon Fraser University

Title: On Extremal Eigenvalues of Trees and Tree-like Graphs

Abstract:

The speaker will present several ongoing projects concerning extremal values of combinations of eigenvalues of n -vertex trees, and will discuss extensions to other classes of sparse graphs. Joint work with Hitesh Kumar, Shivaram Pragada, and Harmony Zhan.

March 16 (evening)

Session chair: Thomás Spier

Speaker: William J. Martin, Worcester Polytechnic Institute

Title: Navigating Eigenspaces of Association Schemes

Abstract:

In 1987, before asking Chris Godsil to be my thesis advisor, I carefully read one of his papers, line by line, start to finish. This talk is about how that one paper has influenced a good fraction of my work since then. I will talk about classifying distance-regular graphs, searching for completely regular codes, a bound for error-correcting codes, Delsarte designs, width and dual width, and the Q -polynomial property. The goal of the talk is to weave a path through these topics, a path with that one paper as its origin.

Speaker: Gordon Royle, University of Western Australia

Title: Hamilton Cycles in Cubic and Other Graphs

Abstract:

A Hamilton cycle in a graph is a cycle passing through every vertex exactly once each. Initially stimulated by connections to the 4-colour theorem, more than a century of research has produced a vast literature on the existence and enumeration of Hamilton cycles. Despite this, many fundamental questions and tantalising conjectures remain unresolved. In this talk, I will consider a number of questions regarding graphs that are extremal with respect to their numbers of Hamilton cycles, in particular those with many or few Hamilton cycles.

March 17 (morning)

Session chairs: Soffía Árnadóttir and Mariia Sobchuk

Speaker: Gabriel Coutinho, Universidade Federal de Minas Gerais

Title: Some Results on the Interplay of Graph Spectra and Quantum Walks

Abstract:

In this talk I will survey some applications of spectral graph theory to continuous-time quantum walks in graphs. Chris and I have collaborated on a number of papers in the topic, and I intend to focus on some of the decisive contributions given by Chris in these papers.

Speaker: Aleksandar Jurišić, University of Ljubljana

Title: Tight Distance-regular Graphs

Abstract:

We will survey research on tight distance-regular graphs and mention some new results.

Speaker: Chris Godsil, University of Waterloo

Title: Christopher, what have you done?

Abstract:

I will discuss some of the work I did before I arrived at Waterloo. So this belongs to what my recent graduate students call the “prehistoric period”, and includes topics such as spectral theory, matching polynomials, and automorphism groups of graphs. [And the title should be read in an annoyed mother’s voice.]

Participants

Ada Chan	York University, Canada
Adrian Vidal	Monash University, Australia
Akihiro Munemasa	Tohoku University, Japan
Alastair Kay	Royal Holloway, University of London, U.K.
Aleksandar Jurišić	University of Ljubljana, Slovenia
Alexander Clifton	Institute for Basic Science, South Korea
Alexander Farrugia	University of Malta Junior College, Malta
Alexander Van Werde	Eindhoven University of Technology, The Netherlands
Allen Herman	University of Regina, Canada
Alyssa Sankey	University of New Brunswick, Canada
Amanda Redlich	University of Massachusetts Lowell, U.S.A.
Ana Trujillo	University of Chile, Chile
Andre E. Brondani	Universidade Federal Fluminense, Brazil
Andrew Woldar	Villanova University, U.S.A.
Andriaherimanana Sarobidy Razafimahatratra	University of Primorska, Slovenia
Anggun Yuliarum Qur'ani	Udayana University, Indonesia
Ann Clifton	Louisiana Tech University, U.S.A.
Antonina Khramova	Eindhoven University of Technology, The Netherlands
Anzila Laikhuram	National Sun Yat-Sen University, Taiwan
Arizka Yuliana	Universitas Gadjah Mada, Indonesia
Aysa Tajeri	York University, Canada
Blake Shirman	York University, Canada
Bogdan Nica	Indiana University Indianapolis, U.S.A.
Bojan Mohar	Simon Fraser University, Canada
Bouifden Rafik	Faculty of Sciences of Tetouan, Morocco
Brendan McKay	Australian National University, Australia
Brendan Rooney	Rochester Institute of Technology, U.S.A.
Bruna lima de Oliveira	Federal Fluminense University, Brazil

Carlos Alfaro	Banxico, Mexico
Caroline Melles	United States Naval Academy, U.S.A.
Chandra Sari Widyaningrum	Indonesia
Cheryl Praeger	University of Western Australia, Australia
Chi Hoi Yip	University of British Columbia, Canada
Chris Godsil	University of Waterloo, Canada
Christino Tamon	Clarkson University, U.S.A.
Christopher van Bommel	University of Guelph, Canada
Craig Larson	Virginia Commonwealth University, U.S.A.
Cristina Dalfo	Universitat de Lleida, Catalonia
Dave Morris	University of Lethbridge, Canada
David Roberson	Technical University of Denmark, Denmark
Dea Alvionita Azka	University of Sriwijaya, Indonesia
Debabrota Mondal	IIT Bhubaneswar, India
Debra Boutin	Hamilton College, U.S.A.
Deddy Rahmadi	UIN Sunan Kalijaga Yogyakarta, Indonesia
Derek Hanely	Penn State Behrend, U.S.A.
Dheer Noal Desai	University of Memphis, U.S.A.
Dom Vito Briones	University of the Philippines - Diliman, The Philippines
Dorteus Lodewyik Rahakbauw	Pattimura University, Indonesia
Dragan Stevanovic	Abdullah Al Salem University, Kuwait & Serbia
Eka Susilowati	Universitas Nahdlatul Ulama Al Ghazali Cilacap, Indonesia
Emanuel Silva	Universidade Federal de Minas Gerais, Brazil
Emily King	Colorado State University, U.S.A.
Eric Nathan Stucky	U.S.A.
Erlangga Rohi	Universitas Gadjah Mada, Indonesia
Flavia Bonomo	University of Buenos Aires, Argentina
Francisca Andrea M. França	Universidade Federal Fluminense, Brazil
Gabor Lippner	Northeastern University, U.S.A.
Gabriel Coutinho	Universidade Federal de Minas Gerais, Brazil
Gaurav Kucheriya	Charles University, Czechia

Gordon Royle	University of Western Australia, Australia
Guillermo Nunez Ponasso	Worcester Polytechnic Institute, U.S.A.
Hajime Tanaka	Tohoku University, Japan
Hanmeng Zhan	Worcester Polytechnic Institute, U.S.A.
Helena Šmigoc	University College Dublin, Ireland
Henry Garrett	U.S.A.
Hermie Monterde	University of Manitoba, Canada
Hiranmoy Pal	National Institute of Technology Rourkela, India
Hitesh Kumar	Simon Fraser University, Canada
Homer Franz De Vera	University of Manitoba, Canada
Ismael El Yassini	University of Waterloo, Canada
Jelena Radovic	University of East Sarajevo, Bosnia and Herzegovina
Jing Zhao	University of Waterloo, Canada
Jinu Jameson	St Berchmans College, India
Jinwon Choi	Sookmyung University, Korea
Jo Ellis-Monaghan	University of Amsterdam, The Netherlands
João Guilherme de Freitas Rocha	Universidade Federal Fluminense, Brazil
João Marcos Costa	Universidade Federal Fluminense, Brazil
John Baptist Gauci	University of Malta, Malta
John Urschel	Massachusetts Institute of Technology, U.S.A.
Joseph Barnes	Louisiana State University Shreveport, U.S.A.
Joseph Malkevitch	York College (CUNY), U.S.A.
Josephine Reynes	University of Waterloo, Canada
Josh Ducey	James Madison University, U.S.A.
Josse van Dobben de Bruyn	Technical University of Denmark, Denmark
Joy Morris	University of Lethbridge, Canada
Juan Paolo Santos	University of the Philippines Diliman, The Philippines
Kadali Kranthi Priya	Indian institute of technology Madras, India
Karen Gunderson	University of Manitoba, Canada
Karen Meagher	University of Regina, Canada

Karen Yeats	University of Waterloo, Canada
Krystal Guo	University of Amsterdam, The Netherlands
Krystal Maughan	University of Vermont, U.S.A.
Kumar Sannidhya Shukla	University of Western Ontario, Canada
Lara Ventura	Universidade Federal Fluminense, Brazil
Leonard Paleta	University of Southern Mindanao, The Philippines
Leonardo de Lima	Federal University of Paraná, Brazil
Levent Tuncel	University of Waterloo, Canada
Logan Crew	University of Waterloo, Canada
Lon Mitchell	Eastern Michigan University, U.S.A.
Lord Kavi	University of Ottawa, Canada
Ludmila Tsiovkina	IMM UB RAS, Russia
Luiz Fernando Oliveira	Universidade Federal Fluminense, Brazil
Maarten De Boeck	University of Memphis, U.S.A.
Mahmud Akelbek	Weber State University, U.S.A.
Marcel Silva	University of Sao Paulo, Brazil
Maria Isabel Bueno Cachadina	University of California Santa Barbara, U.S.A.
Mariia Sobchuk	University of Waterloo, Canada
Mark Kempton	Brigham Young University, U.S.A.
Marshall Kaatz	University of Manitoba, Canada
Martha Suwala	University of Waterloo, Canada
Maurice Moss	Cape Town University, South Africa
Maximiliano Garma	UNAM, Mexico
Maxwell Levit	Simon Fraser University, Canada
Meliana pasaribu	Tanjungpura university, Indonesia
Miquel Àngel Fiol	Universitat Politècnica de Catalunya, Spain
Mike Newman	University of Ottawa, Canada
Milad Ahanjideh	University of Primorska, Slovenia
Ming Tong	University of Waterloo, Canada
Mónica Reyes	Universitat de Lleida, Catalonia
Muhammad Nurul Huda	Gadjah Mada University, Indonesia

Muhammad Siregar	Universitas Gadjah Mada, Indonesia
Nathan Lindzey	Technion, Israel
Nils Van de Berg	Eindhoven University of Technology, The Netherlands
Paul Terwilliger	University of Wisconsin-Madison, U.S.A.
Paul Tricot	Tohoku University, Japan
Paula Kimmerling	Washington State University, U.S.A.
Peter Winkler	Dartmouth, U.S.A.
Piyush Verma	IIT Bhubaneswar, India
Qays Shakir	Middle Technical University, Iraq
Qiuting Chen	University of Paderborn, Germany
Quaid Iqbal	Binghamton University (SUNY), U.S.A
Rachana Soni	Bennett University, India
Rafaela Araujo	Federal Fluminense University, Brazil
Rafał Kalinowski	AGH University of Krakow, Poland
Rajesh Kannan	IIT Hyderabad, India
Ralihe Villagran	Worcester Polytechnic Institute, U.S.A.
Ram Asrey Rajput	Dayalbagh Educational Institute, India
Reem Mahmoud	Virginia Commonwealth University, U.S.A.
Robert Bailey	Memorial University (Grenfell Campus), Canada
Robert Feinberg	University of Maryland - Baltimore County, U.S.A.
Robin Simoens	Ghent University, Belgium
Roghayeh Maleki	University of Primorska, Slovenia
Russ Merris	California State University East Bay, U.S.A.
Sabrina Lato	Umeå Universitet, Sweden
Safet Penjić	University of Primorska, Slovenia
Sandra Kingan	Brooklyn College and CUNY, U.S.A.
Sarojini Mohapatra	National Institute of Technology Rourkela, India
Sasmita Barik	Indian Institute of Technology Bhubaneswar, India
Sayantani Bhattacharya	Auburn University, India
Sebi Cioaba	University of Delaware, U.S.A.

Seth Chaiken	University at Albany, U.S.A.
Shivani Goel	Indian institute of Science Bengaluru, India
Shivaramakrishna Pragada	Simon Fraser University, Canada
Shonda Dueck	University of Winnipeg, Canada
Shuxing Li	University of Delaware, U.S.A.
Smrati Pandey	IIT BHU, India
Soffía Árnadóttir	Danmarks Tekniske Universitet, Denmark
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Steven Tanujaya	Tohoku University, Japan
Swornalata Ojha	National Institute of Technology Rourkela, India
Thomas Lesgourgues	University of Waterloo, Canada
Thomás Spier	Universidade Federal de Minas Gerais, Brazil
Thomas Zaslavsky	Binghamton University (SUNY), U.S.A.
Vishal Gupta	University of Delaware, U.S.A.
Wasin So	San Jose State University, U.S.A.
Wilfried Imrich	Montanuniversität Leoben, Austria
William J. Martin	Worcester Polytechnic Institute, U.S.A.
Xiaohong Zhang	Université de Montréal, Canada
Xinyue Xie	University of Waterloo, Canada
Yilin Li	University of Amsterdam, The Netherlands
Yuval Wigderson	ETH Zurich, Switzerland