

Conference
 $75 + 80 = 155$ years of commutative algebra

Osnabrück
June 13 – 17, 2022

Conference $75 + 80 = 155$ years of commutative algebra

A school and a conference dedicated to Winfried Bruns and Jürgen Herzog on the occasion of their 75th and 80th birthday.

School

There will be a 3-day school (June 13 – 15, 2022) aimed at students and junior researchers with four minicourses (3 hours each). The school will exclusively take place in person.

Speakers of the school are:

Jan Draisma (Universität Bern)
Alessandro De Stefani (Università degli Studi di Genova)
Martina Juhnke-Kubitzke (Universität Osnabrück)
Thomas Kahle (OvGU Magdeburg)

Conference

There will be a workshop after the school (June 15 – 17, 2022). There will be an option to participate in the conference online. A link will be sent to each online participant on time. Please also register if you can only participate online, and please also add a corresponding comment in the registration form.

Keynote lectures devoted to the birthdays of Winfried Bruns and Jürgen Herzog:

Aldo Conca (Università degli Studi di Genova, Italy)
Takayuki Hibi (Osaka University, Japan)

Speakers are:

Alessio D'Alí (Universität Osnabrück, Germany)
Eloísa Grifo (University of Nebraska – Lincoln, USA)
Satoshi Murai (Waseda University, Japan)
Pham Hung Quy (FPT University, Hanoi, Vietnam)
Claudiu Raicu (University of Notre Dame, USA)
Sara Saeedi Madani (Amirkabir University of Technology, Tehran, Iran)
Mateusz Michałek (University of Konstanz, Germany)
Matteo Varbaro (Università degli Studi di Genova, Italy)

Organizers

Aldo Conca (Università degli Studi di Genova, Italy)
Srikanth Iyengar (University of Utah, USA)
Martina Juhnke-Kubitzke (Universität Osnabrück, Germany)
Tim Römer (Universität Osnabrück, Germany)

The Workshop takes place at the University of Osnabrück, Institute of Mathematics, Albrechtstr. 28a, Building 69 (mathematics), room 117 and room 125.

Schedule 75+80=155 years of commutative algebra

	Monday	Tuesday	Wednesday	Thursday	Friday
9:00 am	Welcome Kahle	De Stefani	De Stefani	Hibi (online)	Conca
9:30 am					
10:00 am	Break	Break	Break	D'Alif	Break
10:30 am	Juhnke	Draisma	Juhnke		Murai (online)
11:00 am			Break	Break	
11:30 am			Kahle	Pham Hung Quy (online)	Saeedi Madani
12:00 noon	Lunch	Lunch			
12:30 pm			Lunch	Lunch	Lunch
1:00 pm					
1:30 pm					
2:00 pm	De Stefani	Juhnke	Draisma	Varbaro	Raicu
2:30 pm					
3:00 pm	Break	Break	Break	Poster Session	
3:30 pm	Draisma	Kahle	Welcome Grifo		
4:00 pm				Break	
4:30 pm				Michalek	
5:00 pm					
5:30 pm				Open Mic online	
6:00 pm					
6:30 pm					
7:00 pm			Dinner		
7:30 pm					
8:00 pm					

Abstracts

Monday, June 13, 2022

9:15 – 10:15

Short polynomials and where to find them - 1

Thomas Kahle, Otto-von-Guericke Universität Magdeburg, Germany

A short polynomial is one that has only few terms. What 'few' means can be relative. Certainly monomials and binomials have few terms, but in a determinantal ideal, any polynomial with fewer than factorial many terms would be considered short. In these three lectures we introduce some ideas how to find short polynomials in ideals or decide if there exist any at all.

10:45 – 11:45

Combinatorics of symmetric edge polytopes - 1

Martina Juhnke-Kubitzke, Universität Osnabrück, Germany

Symmetric edge polytopes (SEP) are a class of polytopes that can be associated to any graph and thereby carry a lot of combinatorial structure encoded by the underlying graph. The aim of these lectures is to present and motivate the basic construction and to present combinatorial and geometric properties of those polytopes. This includes in particular the construction of unimodular triangulations of those polytopes via Gröbner basis and a precise description of their facets via labelings of the graph. We will further study the number of i -dimensional faces of SEPs (in particular lower bounds) which will be done through the so-called γ -vector. In particular, we will discuss lower bounds for the number of edges and provide a characterization of the equality case, thereby confirming conjectures by Nevo, Peterson and Lutz. If time permits, we indicate how the face numbers behave if we consider Erdős-Renyi random graphs. The lectures will not assume knowledge on face enumeration of polytopes and are supposed to be introductory. If questions occur during the talks (or afterwards), these are welcome any time.

14:00 – 15:00

Differential and symbolic powers of ideals - 1

Alessandro De Stefani, Università degli Studi di Genova, Italy

The goal of these lectures is to give a (close-to) complete proof of the Zariski-Nagata theorem for polynomial rings over a field or over the integers. The result establishes an equality between symbolic powers of prime ideals and certain kinds of differential powers. The case of a polynomial ring over a field is for most part considered classical, while over the integers this comes from recent work involving the concept of p -derivation.

15:30 – 16:30

GL-varieties - 1

Jan Draisma, University of Bern, Switzerland

A GL -variety is a closed subvariety of a space of (tuples of) infinite x infinite $x \dots x$ infinite-tensors that is stable under the action of the infinite general linear group GL . GL -varieties arise naturally as inverse limits of GL_n -stable varieties of (tuples of) $n \times n \times \dots \times n$ -tensors, and are relevant to applications that range from the geometry of tensor decomposition to finiteness results in commutative algebra such as Stillman's conjecture.

In these lectures, I will describe the structure theory of GL -varieties, some of these applications, and touch on algorithmic issues. My lectures are based on joint work with Bik, Blatter, Danelon, Eggermont, Snowden, and Ventura.

Tuesday, June 14, 2022

9:15 – 10:15

Differential and symbolic powers of ideals - 2

Alessandro De Stefani, Università degli Studi di Genova, Italy

10:45 – 11:45

GL-varieties - 2

Jan Draisma, University of Bern, Switzerland

14:00 – 15:00

Combinatorics of symmetric edge polytopes - 2

Martina Juhnke-Kubitzke, Universität Osnabrück, Germany

15:30 – 16:30

Short polynomials and where to find them - 2

Thomas Kahle, Otto-von-Guericke Universität Magdeburg, Germany

Wednesday, June 15, 2022

9:00 – 10:00

Differential and symbolic powers of ideals - 3

Alessandro De Stefani, Università degli Studi di Genova, Italy

10:15 – 11:15

Combinatorics of symmetric edge polytopes - 3

Martina Juhnke-Kubitzke, Universität Osnabrück, Germany

11:30 – 12:30

Short polynomials and where to find them - 3

Thomas Kahle, Otto-von-Guericke Universität Magdeburg, Germany

14:00 – 15:00

GL-varieties - 3

Jan Draisma, University of Bern, Switzerland

15:45 – 16:45

Cohomological support varieties

Eloísa Grífo, University of Nebraska – Lincoln, USA

Given a ring R , we can associate a variety to each R -module, or more generally each complex of R -modules, which encodes homological information. We will discuss what these varieties are, how they can detect ring theoretic properties of R , and other applications. This is joint work with Ben Briggs and Josh Pollitz.

Thursday, June 16, 2022

09:00 – 10:00

The mathematical legacy of Jürgen Herzog in commutative algebra

Takayuki Hibi, Osaka University, Japan

In honor of great achievements of Jürgen Herzog in commutative algebra, this talk praises his strong influence with earnestly wishing him to continue his activities until at least 90 years old.

10:00 – 11:00

Koszul Gorenstein algebras from Cohen-Macaulay simplicial complexes

Alessio D'Alì, Universität Osnabrück, Germany

Koszul algebras are quadratic algebras satisfying desirable homological properties and arising naturally in many geometric and combinatorial contexts: for instance, the coordinate rings of Veronese, Segre and Grassmannian varieties (in their natural embeddings) are all Koszul, and so is the Stanley-Reisner ring of any flag simplicial complex. However, the Koszul property is notoriously hard to control and to check in general, and many conjectures about the general behaviour of Koszul algebras are currently open. Starting from a flag simplicial complex Δ , we propose a construction of a (non-monomial) quadratic Gorenstein ring R_Δ which is Koszul if and only if Δ is Cohen-Macaulay, thus providing a rather unexpected bridge between these two worlds. On a more combinatorial level, the very same correspondence also yields that R_Δ has a Gröbner basis of quadrics if and only if Δ is shellable. As an application, we provide counterexamples to an algebraic generalization of a conjecture by Charney and Davis about flag homology spheres. This is joint work with Lorenzo Venturello (KTH Stockholm).

11:30 – 12:30

Tight Buchsbaum rings

Pham Hung Quy, FPT University, Hanoi, Vietnam

A Noetherian local ring (R, \mathfrak{m}) is called Buchsbaum if the difference $e(\mathfrak{q}, R) - \ell(R/\mathfrak{q})$, where \mathfrak{q} is an ideal generated by a system of parameters, is a constant independent of \mathfrak{q} . In this article, we study the tight closure analog of this condition. We prove that in an unmixed excellent local ring (R, \mathfrak{m}) of prime characteristic $p > 0$ and dimension at least one, the difference $e(\mathfrak{q}, R) - \ell(R/\mathfrak{q}^*)$ is independent of \mathfrak{q} if and only if the parameter test ideal $\tau_{par}(R)$ contains \mathfrak{m} . This is a jointly work with Linquan Ma.

14:00 – 15:00

Algebraic relation between minors

Matteo Varbaro, Università degli Studi di Genova, Italy

While the algebraic relations between the maximal minors of a generic matrix are quadratic (the Plücker relations), already for 2-minors of a 3×4 generic matrix cubical relations occur. This was first noticed by Winfried Bruns in 1991, and together with him and Aldo Conca we proposed a conjecture in 2013 on the precise form of the minimal relations in general: in particular, our conjecture predicts that quadrics and cubics are always enough. During the talk I will try to survey this fascinating problem, that despite important progresses remains widely open.

16:30 – 17:30

Algebra for oscillators: Khovanskii and Graver bases

Mateusz Michałek, University of Konstanz, Germany

The study of steady states for systems of oscillators leads to very interesting polynomial equations. Computationally, one can guess the maximal number of solutions, as a function of the number of oscillators. We prove this observed bound is correct, using the theory of polytopes and Khovanskii bases. This is a joint work with Paul Breiding, Leonid Monin and Simon Telen.

17:30 – 18:30

Open Mic online

Friday, June 17, 2022

09:00 – 10:00

A tale of determinants, syzygies and powers of ideals

Aldo Conca, Università degli Studi di Genova, Italy

In this talk I will discuss some of the major mathematical achievements of Winfred and some open problems related to them.

10:30 – 11:30

Combinatorial commutative algebra of S_n -invariant monomial ideals

Satoshi Murai, Waseda University, Japan

Finding a combinatorial description of algebraic properties of monomial ideals is a major research theme in combinatorial commutative algebra. In a recent study of S_n -invariant monomial ideals in a polynomial ring with n variables, it has been discovered that several algebraic invariants of these ideals, such as projective dimension, regularity, and Betti numbers, have simple combinatorial descriptions in terms of poset of partitions. I will introduce some typical results in the talk.

11:30 – 12:30

Polytopes and toric algebras arising from matroids and graphs

Sara Saeedi Madani, Amirkabir University of Technology, Iran

Cycle polytopes of matroids have been considered in combinatorial optimization as a generalization of some important classes of polyhedral objects, such as cut polytopes and Eulerian subgraph polytopes associated with graphs. In this talk, we investigate those objects from both algebraic and geometric points of view. In particular, we discuss their toric algebras, called cycle algebras, and their defining ideals. This talk is based on a joint work with Tim Römer.

14:00 – 15:00

Homological algebra for determinantal ideals

Claudiu Raicu, University of Notre Dame, USA

The coordinate ring of the space of $m \times n$ matrices is a polynomial ring, equipped with the action of the group $GL = GL_m \times GL_n$ by row and column operations. The GL -action preserves the determinantal ideals, as well as their powers and symbolic powers. In general, given an ideal which is GL -invariant it is natural to study corresponding homological invariants, and to understand how the symmetries are reflected in the structure of the invariants. In my talk I will present old and new results about invariants such as syzygies and Ext modules, Castelnuovo-Mumford regularity, projective dimension, or the Cohen-Macaulay property, and discuss a number of questions that are still unresolved.

List of participants:

- Abdolmaleki, Reza, Institute for Advanced Studies in Basic Sciences, Iran
- Ahmad, Safyan Mukabir, University, Gujrat, Pakistan
- Ahring, Christian, Universität Osnabrück, Germany
- Ali, Majid, Sultan Qaboos University, Oman
- Alossaimi, Maram, Sheffield University, UK
- Amiri, Zeinab, Universität Osnabrück, Germany
- Anwar, Imran, Lahore University of Management Sciences, Lahore, Pakistan
- Ashraf, Ahmed Umer, Ghent University, Belgium
- Bagheri, Amir, University of Tabriz, Iran
- Bandari, Somayeh, Buein Zahra University, Iran
- Banks, Maya, University of Wisconsin-Madison, USA
- Betti, Barbara, Università degli Studi di Genova, Italy
- Bhardwaj, Om Prakash, Indian Institute of Technology, Gandhinagar, India
- Bigdeli, Mina, Institute for Research in Fundamental Sciences (IPM), Tehran, Iran
- Brenner, Holger, Universität Osnabrück, Germany
- Bruckamp, Justus, Universität Osnabrück, Germany
- Bruns, Winfried, Universität Osnabrück, Germany
- Caminata, Alessio, Università degli Studi di Genova, Italy
- Casabella, Laura, Università di Padova, Italy / Université de Bordeaux, , France
- Chaochao, Chen, Soochow University, China
- Chardin, Marc, CNRS & Sorbonne Université, France
- Chau, Trung, University of Utah, USA
- Chen, Xiangying, Otto-von-Guericke Universität Magdeburg, Germany
- Conca, Aldo, Università degli Studi di Genova, Italy
- D'Alí, Alessio, Universität Osnabrück, Germany
- Danelon, Alessandro, Eindhoven university of technology, Netherlands
- Das, Sudipta, New Mexico State University, USA
- Das, Suprajo, Chennai Mathematical Institute, India
- De Negri, Emanuela, Università degli Studi di Genova, Italy
- De Stefani, Alessandro, Università degli Studi di Genova, Italy
- Debus, Sebastian, UiT The Arctic University of Norway
- Deng, Jiahe, Otto-von-Guericke Universität Magdeburg, Germany
- Dinu, Rodica Andreea, University of Konstanz, Germany
- Draisma, Jan, University of Bern, Switzerland
- Duarte, Luis, Università degli Studi di Genova, Italy
- Eggermont, Rob, Eindhoven University of Technology, Netherlands
- Elias, Joan, Universitat de Barcelona, Spain
- Emmrich, Tarek, Universität Osnabrück, Germany
- Erey, Nursel, Gebze Technical University, Turkey
- Faramarzi, Seadat, Ollah Payam Noor University, Iran
- Ficarra, Antonino, Università degli studi di Messina, Italy
- Gasanova, Oleksandra, Uppsala Universitet, Sweden
- Göbler, Felix, Goethe Universität Frankfurt, Germany
- Goel, Kriti, University of Utah, USA
- Görge, Arian, Otto-von-Guericke Universität Magdeburg, Germany
- Grífo Eloísa, University of Nebraska – Lincoln, USA
- Haase, Christian Freie Universität Berlin, Germany
- Hamed, Ahmed, University of Monastir, Tunisia
- Hassanzadeh, Hamid, Federal University of Rio de Janeiro, Brazil
- Herzog, Jürgen, University of Duisburg-Essen, Germany

- Hibi, Takayuki, Osaka University, Japan
- Hofer, Anna, Otto-von-Guericke Universität Magdeburg, Germany
- Ichim, Bogdan, University of Bucharest, Romania
- Iman, Jahani, Amirkabir University of Technology, Iran
- Juhnke-Kubitzke, Martina, Universität Osnabrück, Germany
- Kahle, Thomas, Otto-von-Guericke Universität Magdeburg, Germany
- Kanwal, Shamsa, HED, Punjab, Pakistan
- Kekkou, Antonia, University of Utah, USA
- Khosh-Ahang, Fahimeh, Ilam University, Iran
- Kiyek, Karl-Heinz, Paderborn University, Germany
- Koley, Mitra, Indian Statistical Institute Kolkata, India
- Kretschmer, Andreas, Otto-von-Guericke Universität Magdeburg, Germany
- Kreuzer, Martin, Passau University, Germany
- Kumar, Arvind, Chennai Mathematical Institute, India
- Kumar, Rajiv, Indian Institute of Technology, Jammu, India
- LaClair, Adam, Purdue University, USA
- Le, Dinh Van, Universität Osnabrück, Germany
- Le, Ngoc Long, Passau University, Germany
- Letz, Janina, Bielefeld University, Germany
- Lizhong, Chu, Soochow University, China
- Lörincz, András, Cristian Humboldt Universität, Germany
- Lu, Dancheng, Soochow University, China
- Lyu, Shiji, Princeton University, USA
- Macchia, Antonio, Freie Universität Berlin, Germany
- Mafi, Amir, University of Kurdistan, Iran
- Martsinkovsky, Alex, Northeastern University, USA
- Mascia, Carla, University of Trento, Italy
- Michałek, Mateusz, University of Konstanz, Germany
- Mondal, Dibyendu, Indian Statistical Institute Kolkata, India
- Mostafazadehfard, Maral, Federal University of Rio de Janeiro, Brazil
- Mukhopadhyay, Alapan, University of Michigan, USA
- Murai, Satoshi, Waseda University, Japan
- Nandy, Ahina, Universität Osnabrück, Germany
- Navarra, Francesco, Università degli studi di Messina, Italy
- Nazir, Shaheen, Lahore University of Management Sciences, Lahore, Pakistan
- Ng Kwing King, Wayne, University of Kansas, USA
- Nguyen, Manh Toan, Universität Osnabrück, Germany
- Nicklasson, Lisa, Università degli Studi di Genova, Italy
- Niederdrenk, Niclas, Otto-von-Guericke Universität Magdeburg, Germany
- Nikita, Khomich, University of Cambridge, UK
- Nowak, Robert, Carl-von-Ossietzky Universität Oldenburg, Germany
- Opara, Innocent, Qumet Institute Abuja, Nigeria
- Orlich, Milo, Aalto University, Finland
- Pham Hung, Quy, FPT University, Hanoi, Vietnam
- Phelan, Peter, NUI Galway, Ireland
- Pourghobadian, Parisa, Alzahra university, Iran
- Qureshi, Ayesha Asloob, Sabanci University, Turkey
- Raicu, Claudiu, University of Notre Dame, USA
- Rehman, Mehmood ur, University of Beira Interior Covilah Portugal
- Riener, Cordian, UiT The Arctic University of Norway
- Römer, Tim, Universität Osnabrück, Germany

- Röndigs, Oliver, Universität Osnabrück, Germany
- Roy, Amit, National Institute of Science Education and Research, Bhubaneswar, India
- Roy, Sudeshna, Chennai Mathematical Institute, India
- Roy, Sumit, Tata Institute of Fundamental Research, Mumbai, India
- Saeedi Madani, Sara, Amirkabir University of Technology, Iran
- Saha, Kamalesh, Indian Institute of Technology Gandhinagar, India
- Sammartano, Alessio, Politecnico di Milano, Italy
- Sandoval Gomez, Sandra, University of Notre Dame, USA
- Saremi, Hero, Islamic Azad University, Teheran, Iran
- Sarkar, Parangama, Indian Institute of Technology Palakkad, India
- Sarkar, Rajib, Tata Institute of Fundamental Research Bombay, India
- Schenzel, Peter, Martin-Luther-Universität Halle, Germany
- Seccia, Lisa, Università degli Studi di Genova, Italy
- Shahada, Mayada, University of Bahrain
- Shamila, Bayati, Amirkabir University of Technology, Iran
- Shan, Jiawen, Soochow University, China
- Sharifan, Leila, Hakim Sabzevari University, Iran
- Simper, Hunter, Purdue University, USA
- Singh, Jyoti, Visvesvaraya National Institute of Technology Nagpur, India
- Sköldbberg, Emil, National University of Ireland, Galway, Ireland
- Sorea, Miruna-Stefan, SISSA, Trieste, Italy
- Sridhar, Prashanth, Charles University in Prague, Czechia
- Srikanth, Iyengar, University of Utah, USA
- Srivastava, Pranjal, Indian Institute of Technology Gandhinagar, India
- Stamate, Dumitru, University of Bucharest, Romania
- Taghipour, Nadia, Amirkabir University of Technology, Iran
- Tolosa Villarreal, Eliana, Università degli Studi di Genova, Italy
- Tran, Nguyen Khanh Linh, Hue University of Education, Vietnam
- Tsakiris, Manolis, Chinese Academy of Sciences, China
- Turhan, Öznur, Galatasaray University, Turkey
- Varbaro, Matteo, Università degli Studi di Genova, Italy
- Van de Bogert, Keller, Notre Dame University, USA
- Veer, Dharm, Chennai Mathematical Institute, India
- Vill, Julian, Otto-von-Guericke Universität Magdeburg, Germany
- von Thaden, Michael, Fachhochschule Westküste, Germany
- von Westenholz, Mandala, Universität Osnabrück, Germany
- Waara, Einar, Uppsala University, Sweden
- Wichmann, Josef, FernUniversität in Hagen, Germany
- Williams, David, The University of Sheffield, UK
- Yang, LiuQing, Soochow University, China
- Yu, Hongmiao, Università degli Studi di Genova, Italy
- Yuan, Beihui, Swansea University, UK
- Yurshevich, Daniil, Jagiellonian University, Poland
- Zakeri, Hossein, Kharazmi University, Tehran, Iran
- Zaman, Fashami Mohammad, Pedagogical university of Cracow, Poland
- Zhang, Shaoyi, Soochow University, China

Practical Information:

Wifi:

In case you do not have Eduroam, please contact us. We will then provide you with the Wifi information.

Social Dinner:

The Conference dinner will take place on Wednesday, 15 June 2022 (19:00) at the restaurant Rampendahl, Hasestraße 35, 49074 Osnabrück.

Historical tour through Osnabrück:

The meeting point is on Thursday, 16 June 2022 (20:00) in front of the town hall / at the Bürgerbrunnen.

On the campus: Mensa, Barbarastraße 20, 49076 Osnabrück

Cafes near the campus:

- Wellmann Bäckerei, Springmannskamp 1, 49090 Osnabrück
- Ayse's Backstube, Natruper Str. 130B, 49090 Osnabrück

Here is a list of restaurants:

Near the campus:

- Italian Job, Natruper Str. 127, 49076 Osnabrück
- Quicky Grill-Bistro, Natruper Str. 137, 49076 Osnabrück

Near the city center:

- Restaurant Walhalla, Bierstraße 24, 49074 Osnabrück
- Osnabrücker Kartoffelhaus, Bierstraße 38, 49074 Osnabrück (German food and Vegan food available)
- Ashoka, Herrenteichstraße 1, 49074 Osnabrück (Indian food)
- Ichiban Sushi, Rolandsmauer 13-15, 49074 Osnabrück
- Saro Tapas Bar & Lounge, Kamp 8, 49074 Osnabrück

Public transportation:

In case you would like to go by public transportation you may use the actual 9 €/person ticket. It may be bought in every bus or at arrival by train at the train station.

From the main train station of Osnabrück, bus line M 2/ 16, direction "Landwehrviertel" will take you to the bus stop "Campus Westerberg" at Sedanstraße in 15 minutes.

To go to the city center (bus stop "Neumarkt") from the campus, take bus line 16/17 at bus stop "Campus Westerberg" in direction "Voxtrup Spitze" or "Gretescher Turm".

Going back from "Neumarkt" to "Campus Westerberg", take line 16/17 in direction "Eversburg Büren" or "Westerkappeln" or "Atter Strothesiedlung".

Around the Institute

