

**Representation Theory, Homological  
Algebra, and Free Resolutions**

February 11 to February 17, 2013

MSRI, Berkeley, CA, USA

Organizers:

**Luchezar Avramov (University of Nebraska)**

**David Eisenbud (University of California, Berkeley)**

**Irena Peeva\* (Cornell University)**

REPORT ON THE MSRI WORKSHOP  
**Representation Theory, Homological Algebra, and Free Resolutions**  
 February 11-17, 2013

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- Luichezar Avramov (University of Nebraska)
- David Eisenbud (University of California at Berkeley)
- Irena Peeva (Cornell University)

The workshop explored homological aspects of the study of commutative rings and their modules in areas where recent developments have had a particularly strong impact. The focus was on recent breakthroughs in understanding and applications of free resolutions and on interactions of commutative algebra and representation theory, where algebraic geometry often appears as a third player. A specific goal of the workshop was to stimulate further interaction between these fields.

**Free resolutions** were introduced by David Hilbert in his work on invariant theory, in order to study numerical functions attached to graded modules. He used resolutions to describe the solutions of inductively defined sequences of systems of linear equations with coefficients in rings. With the advent of homological algebra, part of the attention shifted from resolutions to invariants, constructed by using them, such as derived functors. Subsequent developments have led to surge in interest in the original point of view. Major advances in this classical area have been made during the last decade.

On a basic level, many problems both in commutative algebra and in the **representation theory of finite-dimensional algebras** boil down to classification results about classes of modules and their homomorphisms. In addition both subjects share a number of key contributors, such as Emmy Noether, Wolfgang Krull, and Maurice Auslander, but in the past their trajectories have intersected rarely and unpredictably. The situation is changing rapidly, partly due to newly discovered and actively explored ties between representations of algebras and algebraic geometry, adding a new facet to the traditional ties between algebraic geometry and commutative algebra.

### Special Sessions

The workshop included three and a half ours of short (20 min. each) talks in three parallel special sessions, organized by Milena Herring, Liana Segal, and Hema Srinivasan. There were twenty one such talks. For example:

- Graduate student Luis Nunez gave a talk on associated primes of local cohomology of flat extensions with regular fibers, giving a positive answer in special cases to a

question raised by Hochster.

- Kristen Beck gave a talk on depth and dimension for high syzygies, giving necessary conditions for the stabilization of dimensions of high syzygy modules.
- Leila Khatami gave a talk on nilpotent commutator of a nilpotent matrix.
- Graduate student Alessandro De Stefani gave a talk on artinian level algebras of low socle degree, characterizing  $h$ -vectors which are admissible for level local algebras with  $\mathfrak{m}^4 = t0$ .
- Oana Veliche reported on a recent paper joint with L. Christensen. They give examples of algebra structures that have been conjectured not to occur.
- Graduate student Xin Zhou gave a talk on the syzygies of Veronese embeddings, showing that their Schur decompositions have very rich structures in various asymptotic situations.
- Postdoc Kuei-Nuan Lin reported on a joint work with J. McCullough. They studied regularity of monomial ideals using hypergraphs.

The goal of these special sessions was to give opportunity to junior mathematicians to present their work and to be better integrated in the workshop. The special sessions were a success.

### Highlights of presentations

The first lecture in the workshop was given by Melvin Hochster (University of Michigan), who reported on progress on Stillman's Question whether there exists an upper bound independent on the number of variables on the projective dimension of an ideal generated by forms of fixed degrees  $a_1, \dots, a_n$  in a polynomial ring. G. Caviglia has proved that the problem is equivalent to the existence of an upper bound on the regularity of such ideals. T. Ananyan and M. Hochster recently proved that a bound exists for quadratic and cubic forms.

Four of the plenary lectures were given by postdocs:

- Tobias Dyckerhoff (Yale University) outlined some aspects of the theory of higher Segal spaces which is a joint project with M. Kapranov.
- Daniel Murfet (UCLA) reported on recent joint work with N. Carqueville on the bi-category of Landau-Ginzburg models which is built out of isolated hypersurface singularities and matrix factorisations.
- Jason McCullough (MSRI) discussed constructions of examples with large projective dimension related to Stillman's Question and Hochster's talk.
- Claudiu Raicu (Princeton University) discussed a number of examples of varieties with an action of the general linear group, from the point of view of studying their defining ideals, or more generally their minimal free resolutions.

The closing lecture in the workshop was given by Jürgen Herzog. A natural question to consider for infinite minimal free resolutions is if their invariants are encoded in finite data. The main peak in this direction was the Serre-Kaplansky problem, “*Is the Poincaré series of the residue field over a finitely generated commutative local Noetherian ring rational?*”, which was one of the central questions in Commutative Algebra for many years. The high enthusiasm for research on this problem was partly motivated by the expectation that the answer is positive. However, in 1982 Anick constructed an example of an irrational Poincaré series. Meanwhile, there has been continuing interest in discovering rings (local or graded) over which all modules have rational Poincaré series. J. Herzog and C. Huneke proved during the Fall semester in the special MSRI year in Commutative Algebra that if  $s \geq 2$  and  $I$  is a homogeneous ideal in a polynomial ring  $S$ , then every finitely generated module over the quotient ring  $S/I^s$  has a rational Poincaré series. They established that result for the symbolic powers of  $I$  as well.

## Organizers

First Name	Last Name	Institution
Luchezar	Avramov	University of Nebraska
David	Eisenbud	University of California
Irena	Peeva	Cornell University

## Speakers

First Name	Last Name	Institution
Lidia	Angeleri Huegel	Università di Verona
David	Benson	University of Aberdeen
Ragnar-Olaf	Buchweitz	University of Toronto
Giulio	Caviglia	Purdue University
Marc	Chardin	Centre National de la Recherche Scientifique (CNRS)
Hailong	Dao	University of Kansas
Tobias	Dyckerhoff	Yale University
Gavril	Farkas	Humboldt-Universität
Gavril	Farkas	Humboldt-Universität
Juergen	Herzog	Universitaet Duisburg-Essen
Mel	Hochster	University of Michigan
Osamu	Iyama	Nagoya University
Srikanth	Iyengar	University of Nebraska
Henning	Krause	Universität Bielefeld
Robert	Lazarsfeld	University of Michigan
Jason	McCullough	Rider University
Claudia	Miller	Syracuse University
Rosa	Miro-Roig	University of Barcelona
Daniel	Murfet	University of California
Alexander	Polishchuk	University of Oregon
Claudiu	Raicu	Princeton University
idun	reiten	Norwegian University of Science and Technology (NTNU)
peter	symonds	MSRI - Mathematical Sciences Research Institute
Bernd	Ulrich	Purdue University



## Representation Theory, Homological Algebra, and Free Resolutions

February 11 to February 17, 2013

### Schedule

Monday, February 11, 2013			
9:15 AM - 9:30 AM	Simons Auditorium		Welcome
9:30 AM - 10:30 AM	Simons Auditorium	Melvin Hochster	Ideals and algebras generated by quadratic and cubic forms in polynomial rings
10:30 AM - 11:00 AM	Atrium		Tea
11:00 AM - 12:00 PM	Simons Auditorium	Lidia Angeleri Huegel	t-structures and cotilting modules over commutative noetherian rings
12:00 PM - 2:00 PM	Atrium		Lunch
2:00 PM - 3:00 PM	Simons Auditorium	Idun Reiten	Maximal Cohen-Macaulay modules and generalised cluster categories
3:00 PM - 3:30 PM	Atrium		Tea
4:10 PM - 5:00 PM	UCB, 60 Evans Hall	Steven Cutkosky	MSRI/Evans Lecture: Multiplicities of graded families of ideals

Tuesday, February 12, 2013			
9:30 AM - 10:30 AM	Simons Auditorium	Srikanth Iyengar	The derived category of a complete intersection ring
10:30 AM - 11:00 AM	Atrium		Tea
11:00 AM - 12:00 PM	Simons Auditorium	Alexander Polishchuk	Lefschetz theorems for dg-categories with applications to matrix factorizations
12:00 PM - 2:00 PM	Atrium		Lunch
2:00 PM - 3:00 PM	Simons Auditorium	Daniel Murfet	The bicategory of Landau-Ginzburg models
3:00 PM - 3:30 PM	Atrium		Tea
3:30 PM - 4:30 PM	Simons Auditorium	Peter Symonds	Group actions on rings and the Cech complex

Wednesday, February 13, 2013			
9:30 AM - 10:30 AM	Simons Auditorium	Ragnar-Olaf Buchweitz	Graded Maximal Cohen-Macaulay Modules over Elliptic Curves
10:30 AM - 11:00 AM	Atrium		Tea
11:00 AM - 12:00 PM	Simons Auditorium	Tobias Dyckerhoff	Higher Segal Spaces
12:00 PM - 1:30 PM	Atrium		Lunch
1:30 PM - 2:30 PM	Simons Auditorium	Rosa M. Miró-Roig	The representation type of a projective variety
2:30 PM - 3:00 PM	Atrium		Tea
3:00 PM - 3:20 PM	Simons Auditorium	Alexander Dugas	Periodicity of d-cluster tilted algebras
3:00 PM - 3:20 PM	Commons	Laura Ghezzi	Variation of the first Hilbert coefficients
3:00 PM - 3:20 PM	Baker Board Room	Luis Nunez	Associated primes of local cohomology of flat extensions with regular fibers
3:30 PM - 3:50 PM	Baker Board Room	Kristen Beck	Depth and Dimension for High Syzygies
3:30 PM - 3:50 PM	Simons Auditorium	Jesse Burke	Graded matrix factorizations and complete intersections
3:30 PM - 3:50 PM	Commons	Federico Galetto	Representations with finitely many orbits and free resolutions
4:00 PM - 4:20 PM	Simons Auditorium	Gregory Stevenson	Grothendieck duality and complete intersections
4:00 PM - 4:20 PM	Commons	Louiza Fouli	Lower Bounds for the Depth of Powers of Edge Ideals
4:00 PM - 4:20 PM	Baker Board Room	Javid Validashti	Lech's Inequality
4:30 PM - 6:20 PM	Atrium		Reception

Thursday, February 14, 2013			
9:00 AM - 10:00 AM	Simons Auditorium	Dave Benson	Modules for elementary abelian p-groups and hypersurface singularities
10:00 AM - 10:30 AM	Atrium		Tea
10:30 AM - 11:30 AM	Simons Auditorium	Hailong Dao	Cohen-Macaulay cones and subcategories
11:30 AM - 12:30 PM	Simons Auditorium	Robert Lazarsfeld	Asymptotic syzygies of algebraic varieties

Friday, February 15, 2013			
9:30 AM - 10:30 AM	Simons Auditorium	Gavril Farkas	Syzygies of torsion bundles and the geometry of the level I modular variety over $M_g$
10:30 AM - 11:00 AM	Atrium		Tea
11:00 AM - 12:00 PM	Simons Auditorium	Osamu Iyama	Tilting and cluster tilting for Cohen-Macaulay modules
12:00 PM - 1:30 PM	Atrium		Lunch
1:30 PM - 2:30 PM	Simons Auditorium	Jason McCullough	Bounds on the Projective Dimension and Regularity of Ideals
2:30 PM - 3:00 PM	Atrium		Tea
3:00 PM - 3:20 PM	Baker Board Room	Oana Veliche	Local rings of embedding codepth 3. Examples
3:00 PM - 3:20 PM	Simons Auditorium	Kuei-Nuan Lin	Hypergraphs and Regularity of Square-Free Monomial Ideals
3:00 PM - 3:20 PM	Commons	Olgur Celikbas	On a conjecture of Huneke and R. Wiegand
3:30 PM - 3:50 PM	Baker Board Room	Xin Zhou	Asymptotic Schur Decomposition of Veronese Syzygy Functors
3:30 PM - 3:50 PM	Simons Auditorium	Van Nguyen	Tate cohomology relation for finite dimensional Hopf algebras with an application to group algebras
3:30 PM - 3:50 PM	Commons	Leila Khatami	Nilpotent commutator of a nilpotent matrix
4:00 PM - 4:20 PM	Baker Board Room	Jennifer Biermann	Balanced vertex decomposable simplicial complexes and their h-vectors
4:00 PM - 4:20 PM	Simons Auditorium	Fatemeh Mohammadi	Divisors on graphs, Connected flags, and Syzygies
4:00 PM - 4:20 PM	Commons	Saeed Nasseh	Contracting endomorphisms and dualizing complexes
4:30 PM - 4:50 PM	Baker Board Room	Alessandro De Stefani	Artinian level algebras of low socle degree
4:30 PM - 4:50 PM	Simons Auditorium	Frank Moore	Revisiting Auslander's 1962 ICM Address
4:30 PM - 4:50 PM	Commons	Kavita Sutar	Resolutions of orbit closures of quiver representations

Saturday, February 16, 2013			
9:00 AM - 10:00 AM	UC Berkeley	Bernd Ulrich	Socles, quasi-socles, and integral dependence
10:00 AM - 11:00 AM	UC Berkeley		Break
11:00 AM - 12:00 PM	UC Berkeley	Claudiu Raicu	Equations and syzygies via representation theory and combinatorics
12:00 PM - 1:30 PM	UC Berkeley		Lunch
1:30 PM - 2:30 PM	UC Berkeley	Claudia Miller	Duality Phenomena for Koszul Homology
2:30 PM - 3:30 PM	UC Berkeley		Break
3:30 PM - 4:30 PM	UC Berkeley	Henning Krause	Koszul, Ringel, and Serre duality for strict polynomial functors

Sunday, February 17, 2013			
9:00 AM - 10:00 AM	UC Berkeley	Giulio Caviglia	Some results on the Lex-Plus-Power conjecture
10:00 AM - 10:15 AM	UC Berkeley		Break
10:15 AM - 11:15 AM	UC Berkeley	Marc Chardin	Powers of graded ideals
11:15 AM - 11:30 AM	UC Berkeley		Break
11:30 AM - 12:30 PM	UC Berkeley	Juergen Herzog	Ordinary and symbolic powers are Golod



## Participants

First Name	Last Name	Institution
Lidia	Angeleri Huegel	Università di Verona
Katie	Ansaldi	University of Notre Dame
Luchezar	Avramov	University of Nebraska
Arindam	Banerjee	University of Kansas
Kristen	Beck	University of Arizona
Hanno	Becker	University of Bonn
Gwyn	Bellamy	University of Glasgow
David	Benson	University of Aberdeen
Petter	Bergh	Norwegian University of Science and Technology (NTNU)
Jennifer	Biermann	Lakehead University
Manuel	Blickle	Johannes Gutenberg-Universität Mainz
Mats	Boij	Royal Institute of Technology (KTH)
Holger	Brenner	Universität Osnabrück
Michael	Brown	University of Nebraska
Ragnar-Olaf	Buchweitz	University of Toronto
Jesse	Burke	University of California
Jon	Carlson	University of Georgia
Giulio	Caviglia	Purdue University
Olgur	Celikbas	University of Missouri
Kenneth	Chan	University of Washington
Marc	Chardin	Centre National de la Recherche Scientifique (CNRS)
Harrison	Chen	UC Berkeley Math Faculty
Maria	Chlouveraki	Université Versailles/Saint Quentin-en-Yvelines
Yonghwa	Cho	Korea Advanced Institute of Science and Technology (KAIST)
Lars	Christensen	Texas Tech University
Gemma	Colomé-Nin	Purdue University
William	Crawley-Boevey	University of Leeds
Steven	Cutkosky	University of Missouri
Hailong	Dao	University of Kansas
Alessandro	De Stefani	University of Kansas
Kosmas	Diveris	St. Olaf College
Emilie	Dufresne	Universität Basel
Alex	Dugas	University of the Pacific
Tobias	Dyckerhoff	Yale University
John	Eagon	University of Minnesota Twin Cities
Rebecca	Egg	University of Nebraska
Michael	Ehrig	Universität Bonn
David	Eisenbud	University of California
Juan	Elias	University of Barcelona
Eleonore	Faber	University of Toronto
Gavril	Farkas	Humboldt-Universität
Gavril	Farkas	Humboldt-Universität
Gunnar	Floystad	University of Bergen
Louiza	Fouli	New Mexico State University
Federico	Galetto	Northeastern University
Laura	Ghezzi	New York City Technical College, CUNY
Kenneth	Goodearl	University of California

Mikhail	Gudim	University of Toronto
Tai	Ha	Tulane University
Mitsuyasu	Hashimoto	Nagoya University
Ines	Henriques	University of California
Milena	Hering	University of Edinburgh
Juergen	Herzog	Universitaet Duisburg-Essen
Lutz	Hille	Westfälische Wilhelms-Universität Münster
Mel	Hochster	University of Michigan
Justin	Hoffmeier	University of Missouri
Birge	Huisgen-Zimmerm	University of California
Alina	Iacob	Georgia Southern University
Colin	Ingalls	University of New Brunswick
Osamu	Iyama	Nagoya University
Srikanth	Iyengar	University of Nebraska
Andrew	Jaramillo	University of California
Jack	Jeffries	University of Utah
David	Jorgensen	University of Texas
Moty	Katzman	University of Sheffield
Leila	Khatami	Union College--Union University
Yeong Rak	Kim	Korea Advanced Institute of Science and Technology (KAIST)
Youngsu	Kim	Purdue University
Henning	Krause	Universität Bielefeld
Sijong	Kwak	Korea Advanced Institute of Science and Technology (KAIST)
Robert	Lazarsfeld	University of Michigan
Graham	Leuschke	Syracuse University
Jinjia	Li	University of Louisville
Kuei-Nuan	Lin	University of California
Haydee	Lindo	University of Nebraska
joseph	Lipman	Purdue University
Jason	Lutz	University of Nebraska
Tom	Marley	University of Nebraska
Matey	Mateev	Universität Basel
Jason	McCullough	Rider University
Marianne	Merz	Freie Universität Berlin
Claudia	Miller	Syracuse University
Cleto	Miranda Neto	Federal University of Paraíba
Rosa	Miro-Roig	University of Barcelona
fatemeh	mohammadi	Philipps-Universität Marburg
Fatemeh	Mohammadi Aghje	Islamic Azad University
Jonathan	Montano	Purdue University
Frank	Moore	Wake Forest University
Andrew	Morrison	Eidgenössische TH Zürich-Hönggerberg
Andrew	Morrison	Eidgenössische TH Zürich-Hönggerberg
Vivek	Mukundan	Purdue University
Satoshi	Murai	Yamaguchi University
Daniel	Murfet	University of California
Saeed	Nasseh	North Dakota State University
Amnon	Neeman	Australian National University
Thomas	Nevins	University of Illinois at Urbana-Champaign
Lan	Nguyen	Purdue University



Van	Nguyen	Texas A & M University
Luis	Nunez-Betancourt	University of Michigan
KAZUHO	OZEKI	Yamaguchi University
Keith	Pardue	NSA - National Security Agency
Jung Pil	Park	Seoul National University
Bregje	Pauwels	University of California
Jeremy	Pecharich	Mount Holyoke College
Irena	Peeva	Cornell University
Julia	Pevtsova	University of Washington
Vinh	Pham	University of Missouri
Greg	Piepmeyer	University of Missouri
Claudia	Polini	University of Notre Dame
Alexander	Polishchuk	University of Oregon
David	Pospisil	Karlovy (Charles) University (UK)
Hamid	Rahmati	Miami University
Claudiu	Raicu	Princeton University
Ali	Rajaei	Tarbiat Modares
Kristian	Ranestad	University of Oslo
idun	reiten	Norwegian University of Science and Technology (NTNU)
Alice	Rizzardo	International School for Advanced Studies (SISSA/ISAS)
Steven	Sam	Massachusetts Institute of Technology
William	Sanders	University of Kansas
Antonio	Sartori	Universität Bonn
Sean	Sather-Wagstaff	North Dakota State University
Travis	Schedler	University of Texas
Liana	Sega	University of Missouri
Katharine	Shultis	University of Nebraska
Susan	Sierra	University of Edinburgh
Anurag	Singh	University of Utah
Ilya	Smirnov	University of Kansas
Gregory	Smith	Queen's University
Frank	Sottile	Texas A & M University
Suresh	Srinivasamurthy	Kansas State University
Hema	Srinivasan	University of Missouri
John	Stafford	University of Manchester
James	Stark	University of Washington
Johan	Steen	Norwegian University of Science and Technology (NTNU)
Greg	Stevenson	Universität Bielefeld
Michael	Stillman	Cornell University
Branden	Stone	Bard College
Janet	Striuli	Fairfield University
Catharina	Stroppel	Max-Planck-Institut für Mathematik
Stephen	Sturgeon	University of Kentucky
Kavita	Sutar	Chennai Mathematical Institute
peter	symonds	MSRI - Mathematical Sciences Research Institute
Ryo	Takahashi	Nagoya University
Jan	Trlifaj	Karlovy (Charles) University (UK)
Bernd	Ulrich	Purdue University
Javid	Validashti	University of Illinois at Urbana-Champaign
Adam-Christiaan	van Roosmalen	University of Regina

Matteo	Varbaro	Università di Genova
Oana	Veliche	Northeastern University
Friedrich	Wagemann	Universite de Nantes
Chelsea	Walton	Massachusetts Institute of Technology
Marcus	Webb	University of Nebraska
David	Wehlau	Royal Military College of Canada
Jerzy	Weyman	Northeastern University
Roger	Wiegand	University of Nebraska
Sylvia	Wiegand	University of Nebraska
Sarah	Witherspoon	Texas A&M University
Emily	Witt	University of Minnesota Twin Cities
Zheng	Yang	University of Nebraska
Siamak	Yassemi	University of Tehran
Amnon	Yekutieli	Ben Gurion University of the Negev
Xuan	Yu	University of Nebraska
Dan	Zacharia	Syracuse University
Santiago	Zarzuela	University of Barcelona
James	Zhang	University of Washington
Wenliang	Zhang	University of Nebraska
Yi	Zhang	MSRI - Mathematical Sciences Research Institute
Xin	Zhou	University of Michigan
Radoslav	Zlatev	Cornell University

**Officially Registered Participant Information**

<b>Participants</b>		<b>169</b>
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<b>Gender</b>		<b>169</b>
<b>Male</b>	73.96%	125
<b>Female</b>	23.67%	40
<b>Declined to state</b>	2.37%	4

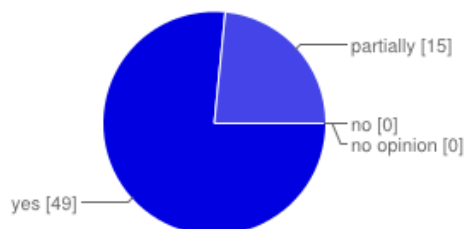
<b>Ethnicity*</b>		<b>169</b>
<b>White</b>	67.46%	114
<b>Asian</b>	21.30%	36
<b>Hispanic</b>	1.18%	2
<b>Pacific Islander</b>	0.00%	0
<b>Black</b>	1.18%	2
<b>Native American</b>	0.00%	0
<b>Mixed</b>	0.59%	1
<b>Declined to state</b>	8.28%	14

\* ethnicity specifications are not exclusive

## Summary [See complete responses](#)

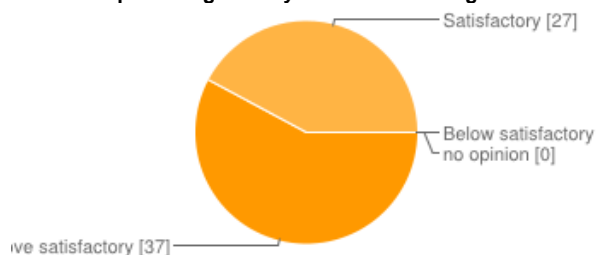
### Topic presentation and organization

Did the various topics within the workshop integrate into a coherent picture?



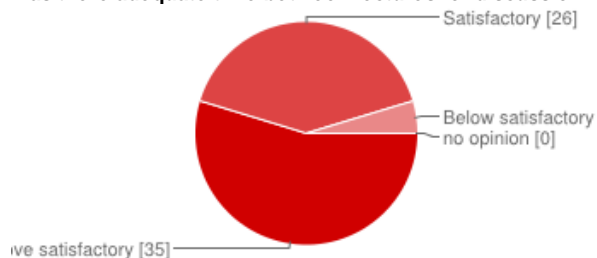
yes	49	77%
partially	15	23%
no	0	0%
no opinion	0	0%

Were the speakers generally clear and well organized in their presentation?



Above satisfactory	37	58%
Satisfactory	27	42%
Below satisfactory	0	0%
no opinion	0	0%

Was there adequate time between lectures for discussion?



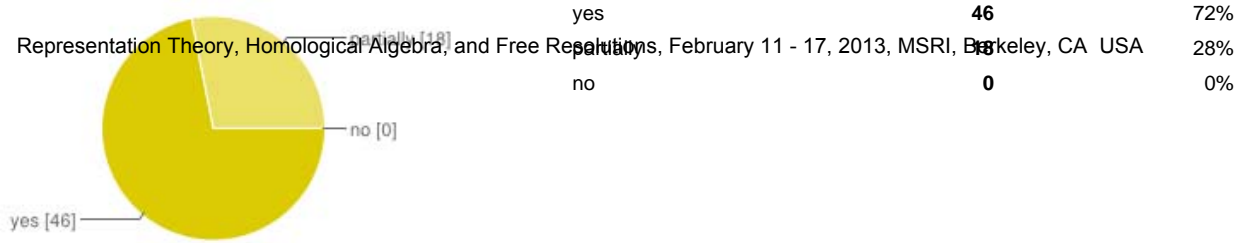
Above satisfactory	35	55%
Satisfactory	26	41%
Below satisfactory	3	5%
no opinion	0	0%

#### Additional comments on the topic presentation and organization

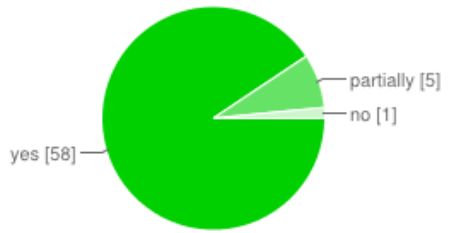
I didn't like the parallel sessions I can't see text written by white chalk on a white (dirty) blackboard :( avoided. Also, the workshop should not include ...

Too many talks; parallel sessions should be

### Personal assessment

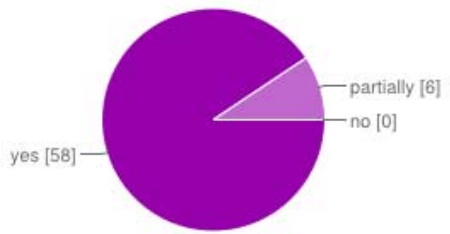


**Did the workshop increase your interest in the subject?**



yes	58	91%
partially	5	8%
no	1	2%

**Was the workshop worth your time and effort?**



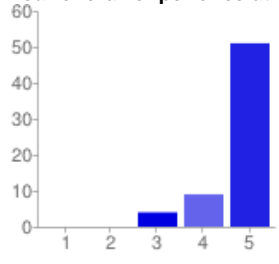
yes	58	91%
partially	6	9%
no	0	0%

**Additional comments on your personal assessment**

It was again perfect      The workshop was too "heavy": Too many talks, running through the weekend      The talks which were best were those where the audience asked questions during the talk. These talks were ...

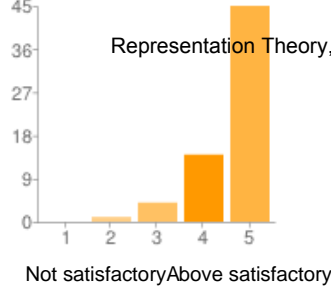
**Venue**

**Your overall experience at MSRI**

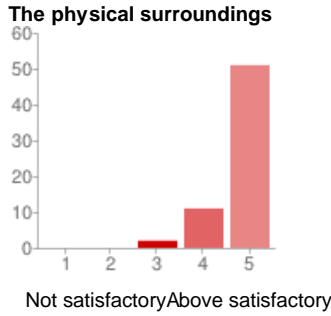


1 - Not satisfactory	0	0%
2	0	0%
3	4	6%
4	9	14%
5 - Above satisfactory	51	80%

Not satisfactory Above satisfactory



Satisfaction Level	Count	Percentage
1 - Not satisfactory	0	0%
2	2	3%
3	4	6%
4	14	22%
5 - Above satisfactory	45	70%



Satisfaction Level	Count	Percentage
1 - Not satisfactory	0	0%
2	0	0%
3	2	3%
4	11	17%
5 - Above satisfactory	51	80%

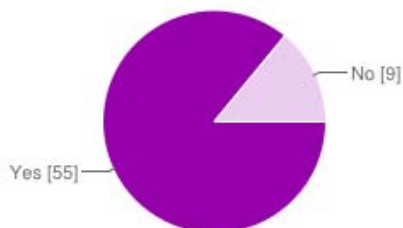


Satisfaction Level	Count	Percentage
1 - Not satisfactory	0	0%
2	2	3%
3	24	38%
4	22	34%
5 - Above satisfactory	16	25%



Satisfaction Level	Count	Percentage
1 - Not satisfactory	0	0%
2	3	5%
3	8	13%
4	24	38%
5 - Above satisfactory	29	45%

Did you use MSRI's wireless network?



Response	Count	Percentage
Yes	55	86%
No	9	14%

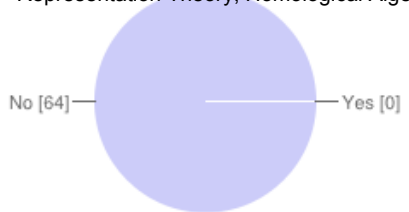
**Did you experience any difficulties with the network?**

Representation Theory, Homological Algebra, and Free Resolutions, February 11 - 17, 2013, MSRI, Berkeley, CA USA

Yes  
No

0  
64

0%  
100%



**If you did experience difficulties with the network, please explain:**

N/A

**Additional comments on the venue**

Find better erasers for the blackboards. The current ones leave the blackboards too dirty, once they have been used three/four times on a given blackboard.

vegan options, please!

The tea water often t ...

**Thank you for completing this survey**

**We welcome any additional comments or suggestions you may have to improve the overall experience for future participants.**

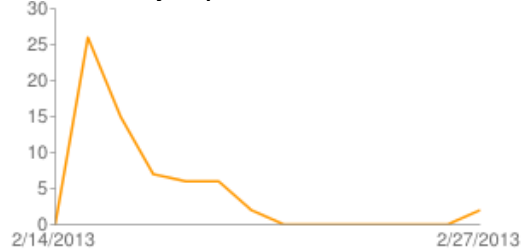
Please use name tags without safety pins.

I would like to extremely thank you for

everything

parallel sessions are unpleasant; name tags should have clips or lanyards instead of pins; this textbox is ...

**Number of daily responses**





# Representation Theory, Homological Algebra, and Free Resolutions February 11 to February 17, 2013

## Additional Survey Responses

### Additional comments on the topic presentation and organization

- I didn't like the parallel sessions
- I can't see text written by white chalk on a white (dirty) blackboard :(
- Too many talks; parallel sessions should be avoided. Also, the workshop should not include the weekend.
- Greater suggestion that speakers discuss fewer results in greater depth could be given. In particular, more of a push towards board talks could help this.
- There were too many talks.
- For better readability, blackboards should be properly cleaned before each lecture
- I think that you could add more talks every day and do not have to come during the weekend. 7 days is too much.
- I didn't like having to choose between closely related topics during the shorter twenty minute talks.
- Excellent choice of topics
- The blackboard becomes white quickly and hard to read.
- A few of the younger speakers gave talks that were too technical and covered too much.
- This was a very long workshop. Some of the breaks could have been shortened so we wouldn't have talks over the weekend.

### Additional comments on your personal assessment

- This was a very long workshop. Some of the breaks could have been shortened so we wouldn't have talks over the weekend.
- The workshop was too "heavy": Too many talks, running through the weekend
- The talks which were best were those where the audience asked questions during the talk. These talks were paced so that the audience had time to formulate questions/comments. Perhaps the 10 minute question periods at the end might be more effective if the organizers placed part of that mid-way in the talk. It would also help to let the speaker assess how his/her pace is.
- This was an outstanding conference collecting some of the leading experts in the area
- The lectures were very useful to me
- I learned a lot, both from talks and from informal collaborations that began during the workshop.

### Additional comments on the venue

- Find better erasers for the blackboards. The current ones leave the blackboards too dirty, once they have been used three/four times on a given blackboard.
- vegan options, please!
- The tea water often tasted like coffee.
- Gorgeous location!
- More vegetarian options at the reception would be welcome.
- A great place (and splendid weather, too!)
- Great surroundings for discussion and work. Great library!
- The venue is exceptional
- I didn't attend the reception.
- no phone signal
- A great place to do math!

**We welcome any additional comments or suggestions you may have to improve the overall experience for future participants.**

- Please use name tags without safety pins
- I would like to extremely thank you for eve
- parallel sessions are unpleasant; name tags should have clips or lanyards instead of pins; this textbox is too small