Connections for Women: Joint Workshop on Commutative Algebra and Cluster Algebras

August 22, 2012 to August 24, 2012

MSRI, Berkeley, CA, USA

Organizers:

Claudia Polini (University of Notre Dame)

Idun Reiten (Norwegian University of Science and Technology)

Karen Smith (University of Michigan)

Lauren Williams* (University of California, Berkeley)

Final Report for the MSRI Connections for Women Workshop: Commutative algebra and cluster algebras

Organizers: Claudia Polini, Idun Reiten, Karen Smith, and Lauren Williams

The goal of this workshop was to give an introduction to topics in commutative algebra and cluster algebras, via talks and a mini-course, all of which were given by women. (However, the audience was a mix of men and women.) A secondary goal was to encourage and facilitate the exchange of ideas between researchers in commutative algebra and researchers in cluster algebras. The workshop consisted of:

1. **A mini-course** on the topic of cluster algebras, together with a problem session.
2. **Nine lectures**, some of which were expository, and some of which were research talks.
3. **A poster session**, in which junior researchers presented their results.
4. **A panel discussion**, in which several tenure-track and tenured female professors discussed issues related to being a female mathematician.

In addition to these activities, there were multiple tea breaks, and a wine and cheese social, in which participants could get to know each other and discuss mathematics.

Details on the minicourse and lectures

Minicourse on cluster algebras

Lauren Williams gave two lectures which introduced the notion of cluster algebra, and gave several examples, including the coordinate ring of the Grassmannian. She gave several problems for participants to think about, and Kelli Talaska led a problem session to help participants with these problems.

Lectures on commutative algebra

Claudia Miller (Professor of Mathematics at Syracuse University) spoke on 'Duality for Koszul Homology over Gorenstein Rings'. She first explained the classical results, due to Herzog, and then reported on recent developments obtained in collaboration with Hamid Rahmati and Janet Striuli. The aim of their work is to show that the duality forces the Cohen-Macaulayness of the Koszul homology modules whenever a certain amount of local depth is present. Irena Swanson (Professor of Mathematics at Reed College) talked about 'Minimal components over certain binomial ideals'. The work done in collaboration with Amelia Taylor, Julia Porcino, and Alessio Sammartano, spanned three different papers. Their original goal was to understand Alex Fink's paper on minimal components arising in algebraic statistics. In several instances they express the minimal components in terms of some combinatorial structures. Vijaylaxmi Trivedi (Professor at Tata Institute of Fundamental Research, Mumbai, India) delivered a lecture on her recent work on Hilbert-Kunz multiplicities. The Hilbert-Kunz multiplicity is a fundamental invariant that like the ordinary multiplicity carries meaningful information about the singularities of a local Noetherian

ring in characteristic p. The Hilbert Kunz multiplicity has been instrumental to prove, for instance, that tight closure does not localize. Unlike the ordinary multiplicity, the Hilbert-Kunz multiplicity is very difficult to compute and any result that sheds light on this mysterious invariant is a great progress towards the understanding of the structure of rings in positive characteristic. Maria Evelina Rossi (Professor of Mathematics at the University of Genova, Italy) presented recent results concerning isomorphism classes of Artin K-algebras through Macaulay's inverse system. The goal was to prove that the study of certain classes of Artin local rings can be reduced to the study of standard graded K-algebras. Interesting application to the rationality of the Poincar series were given. Finally, Alicia Dickenstein (Professor of Mathematics at the University of Buenos Aires, Argentina) described the use of linear syzygies for the implicitization of rational surfaces. These algebraic techniques, based on the theory of approximation complexes due to Jrgen Herzog, Aron Simis and Wolmer Vasconcelos, were introduced in this setting by Laurent Bus, Marc Chardin and Jean Pierre Jouanolou, whose work was inspired by the "practical" method of moving curves, proposed by Thomas Sederberg and Falai Chen.

Lectures on cluster algebras

There were four lectures on topics related to cluster algebras. Karin Baur gave a talk on *Cluster algebras, quiver mutation, and triangulations*, which was an expository talk on cluster algebras associated to surfaces. The combinatorics of such cluster algebras is encoded by triangulations of the surface. Gordana Todorov gave an expository talk on *Relations between cluster algebras and cluster categories,* in which she explained how the *cluster category* provides a categorification of a cluster algebra. In this construction, cluster variables are replaced by quiver representations, and one may use the representation theory of quivers to understand the corresponding cluster algebra. Konstanze Rietsch gave a talk on *Mirror symmetry for Grassmannians,* in which she explained how to construct the superpotential by using the cluster algebra structure on Grassmannians. Kelli Talaska gave a talk on *Networks and the Deodhar decomposition of real Grassmannians,* which explained how to parameterize Deodhar components in the Grassmannian. (This construction generalizes Postnikov's parameterization of cells in the totally non-negative part of the Grassmannian.)

Conclusion

We were extremely pleased with the outcome of the MSRI Connections workshop on commutative algebra and cluster algebras, and think that it was a very rewarding experience for the participants.

Participants seemed to enjoy the minicourse and lectures very much, and there were a number of questions after each talk. The atmosphere during the conference was very friendly and down-to-earth. One person wrote "I am very happy to say I never expected such an incredible experience getting to meet so many wonderful people from staff to students to mathematician." Other participants commented that they enjoyed being at a conference with so many women. The panel discussion was a lively discussion that involved both men and women in the audience. The men seemed to find the discussion very interesting, and one senior male mathematician asked what male mathematicians can do to help female mathematicians.

Organizers		
First Name	**Last Name**	**Institution**
Claudia	Polini	University of Notre Dame
Idun	Reiten	Norwegian University of Science and Technology
Karen	Smith	University of Michigan
Lauren	Williams	University of California (Lead Organizer)

Speakers		
First Name	**Last Name**	**Institution**
Karin	Baur	Karl-Franzens-Universität Graz
Alicia	Dickenstein	University of Buenos Aires
Claudia	Miller	Syracuse University
Konstanze	Rietsch	King's College London
Maria Evelina	Rossi	Università di Genova
Irena	Swanson	Reed College
Kelli	Talaska	University of California
Gordana	Todorov	Northeastern University
Vijaylaxmi	Trivedi	Tata Institute of Fundamental Research
Lauren	Williams	University of California

Connections for Women:
Joint Workshop on Commutative Algebra and Cluster Algebras

August 22 - 24, 2012

Schedule

Wednesday, August 22, 2012			
9:00 AM - 9:15 AM	Simons Auditorium		Welcome
9:15 AM - 10:15 AM	Simons Auditorium	Lauren William	Mini Course: Basics of Cluster Algebras
10:15 AM - 10:45 AM	Atrium		Coffee Break
10:45 AM - 11:35 AM	Simons Auditorium	Claudia Miller	Duality for Koszul Homology over Gorenstein Rings
11:35 AM - 12:30 PM	Atrium		Poster Session I
12:30 PM - 2:00 PM	Atrium		Lunch
2:00 PM - 2:50 PM	Simons Auditorium	Karin Baur	Cluster algebras, quiver mutation and triangulations.
2:50 PM - 3:30 PM	Atrium		Poster Session II
3:30 PM - 5:00 PM	Atrium		Wine and cheese social

Thursday, August 23, 2012			
9:00 AM - 10:00 AM	Simons Auditorium	Lauren Williams	Mini Course: Basics of Cluster Algebras
10:00 AM - 10:30 AM	Atrium		Coffee Break
10:30 AM - 12:00 PM	Simons Auditorium	Kelli Talaska	Discussion session for the Mini Course
12:00 PM - 1:30 PM	Atrium		Lunch
1:30 PM - 2:20 PM	Simons Auditorium	Irena Swanson	Minimal components over certain binomial ideals
2:30 PM - 3:20 PM	Simons Auditorium	Vijaylaxmi Trivedi	Hilbert-Kunz multiplicity and Hilbert-Kunz slope
3:30 PM - 4:00 PM	Atrium		Tea break
4:00 PM - 4:50 PM	Simons Auditorium	Gordana Todorov	Relations between Cluster Algebras and Cluster Categories.

Friday, August 24, 2012			
9:00 AM - 10:00 AM	Simons Auditorium	Konstanze Rietsch	On mirror symmetry for Grassmannians
10:00 AM - 10:30 AM	Atrium		Coffee Break
10:30 AM - 11:20 AM	Simons Auditorium	Maria Evelina Rossi	Analytic Isomorphisms of Artin local K-algebras
11:30 AM - 12:20 PM	Simons Auditorium	Kelli Talaska	Networks and the Deodhar decomposition of real Grassmannians
12:30 PM - 2:00 PM	Atrium		Lunch
2:00 PM - 2:50 PM	Simons Auditorium	Alicia Dickenstein	Implicitization techniques: easy algorithms, deep proofs.
3:00 PM - 3:30 PM	Atrium		Tea break
3:30PM - 5:00PM	Simons Auditorium		Panel Discussion

Participants

First Name	Last Name	Institution
Kathleen	Ansaldi	University of Notre Dame
Federico	Ardila	San Francisco State University
Spencer	Backman	Georgia Institute of Technology
Helene	Barcelo	MSRI - Mathematical Sciences Research Institute
Emily	Barnard	North Carolina State University
Karin	Baur	Karl-Franzens-Universität Graz
Arkady	Berenstein	University of Oregon
Christine	Berkesch Zamaere	Duke University
Florian	Block	UC Berkeley Math Faculty
Mats	Boij	Royal Institute of Technology (KTH)
Sarah	Brodsky	University of California
Man-Wai	Cheung	University of California, San Diego
Steven	Collazos	San Francisco State University
Aldo	Conca	Università di Genova
Alicia	Dickenstein	University of Buenos Aires
Idan	Eisner	University of Haifa
Sabine	El Khoury	American University of Beirut
Laura	Escobar	Cornell University
Sara	Faridi	Dalhousie University
Anna	Felikson	Jacobs University Bremen
Xiao	Feng	Michigan State University
Alex	Fink	North Carolina State University
Bruce	Fontaine	MSRI - Mathematical Sciences Research Institute
Claudio	Fontanari	Università degli Studi di Trento
Louiza	Fouli	New Mexico State University
Alexander	Garver	University of Minnesota Twin Cities
Michael	Gekhtman	University of Notre Dame
Sira	Gratz	Universität Hannover
Elizabeth	Gross	University of Illinois
Emily	Gunawan	University of Minnesota Twin Cities
Ines	Henriques	University of California
Daniel	Hernandez	University of Minnesota Twin Cities
Olga	Holtz	University of California
Aline	Hosry	Notre Dame University, Lebanon
Alina	Iacob	Georgia Southern University
Srikanth	Iyengar	University of Nebraska
Jack	Jeffries	University of Utah
haridas	kalbhor	University of Pune, Maharashtra (India)
Adam	Kalman	University of California
Steven	Karp	UC Berkeley Math Faculty
Leila	Khatami	Union College--Union University
Robert	Korsan	retired
Kaie	Kubjas	Freie Universität Berlin
Manoj	Kummini	Chennai Mathematical Institute
Volha	Kushel	TU Berlin
Lisa	Lamberti	Eidgenössische TH Zürich-Zentrum
Phillpp	Lampe	Universität Bielefeld
Kuei-Nuan	Lin	University of California
Jichun	Liu	Zhejiang University
Antonio	Macchia	Università di Bari
Diane	Maclagan	University of Warwick

Jeff	Madsen	University of Notre Dame
Paolo	Mantero	Purdue University
Robert	Marsh	University of Leeds
Sarah	Mayes	University of Michigan
Jason	McCullough	MSRI - Mathematical Sciences Research Institute
Claudia	Miller	Syracuse University
Jonathan	Montano	Purdue University
Sophie	Morier-Genoud	Université de Paris VI (Pierre et Marie Curie)
Gregg	Musiker	University of Minnesota Twin Cities
Leatitia	Mutombo	University Of Kinshasa
Alfredo	Nájera Chávez	Université de Paris VII (Denis Diderot)
Tomoki	Nakanishi	Nagoya University
BHARATH	NARAYANAN	Pennsylvania State University
Alyssa	Palfreyman	San Francisco State University
Rebecca	Patrias	University of Minnesota Twin Cities
Servando	Pineda Carranza	San Francisco State University
Pierre-Guy	Plamondon	Université de Caen
Claudia	Polini	University of Notre Dame
Fan	QIN	Université de Paris VII (Denis Diderot)
Jenna	Rajchgot	MSRI - Mathematical Sciences Research Institute
Denise	Rangel	University of Texas
idun	reiten	Norwegian University of Science and Technology
Vladimir	Retakh	Rutgers University
Konstanze	Rietsch	King's College London
Elina	Robeva	University of California
Maria Evelina	Rossi	Università di Genova
dylan	rupel	MSRI - Mathematical Sciences Research Institute
Steven	Sam	University of California
Jennifer	Schaefer	Dickinson College
Gus	Schrader	UC Berkeley Math Faculty
Alexandra	Seceleanu	University of Nebraska
Anurag	Singh	University of Utah
Karen	Smith	University of Michigan
Suresh	Srinivasamurthy	Kansas State University
Janet	Striuli	Fairfield University
Irena	Swanson	Reed College
Kaisa	Taipale	MSRI - Mathematical Sciences Research Institute
Kelli	Talaska	University of California
Geetha	Thangavelu	Institute of Mathematical Sciences
Howard	Thompson	University of Michigan
Gordana	Todorov	Northeastern University
vijaylaxmi	trivedi	Tata Institute of Fundamental Research
Bernd	Ulrich	Purdue University
Alexander	Vainshtein	University of Haifa
Yadira	Valdivieso Diaz	Universidad Nacional de Mar del Plata
Emanuele	Ventura	Università di Catania
Roger	Wiegand	University of Nebraska
Sylvia	Wiegand	University of Nebraska
Lauren	Williams	University of California
Emily	Witt	University of Minnesota Twin Cities
Nora	Youngs	University of Nebraska
Josephine	Yu	Georgia Institute of Technology
Andrei	Zelevinsky	Northeastern University

Officially Registered Participant Information

Participants		**104**

Gender		**104**
Male	46.15%	48
Female	53.85%	56
Declined to state	0.00%	0

Ethnicity*		**104**
White	65.38%	68
Asian	14.42%	15
Hispanic	8.65%	9
Pacific Islander	0.00%	0
Black	1.92%	2
Native American	0.00%	0
Mixed	0.96%	1
Declined to state	8.65%	9

* ethnicity specifications are not exclusive

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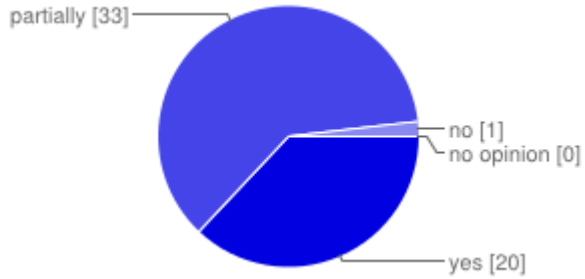
54 responses

Summary See complete responses

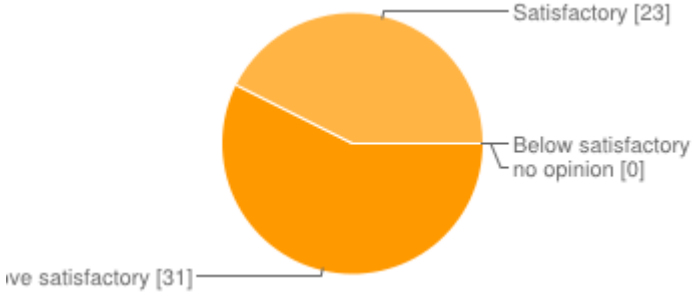
Topic presentation and organization

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



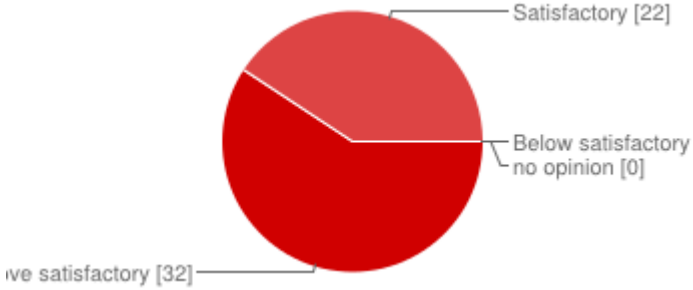
yes	**20**	37%
partially	**33**	61%
no	**1**	2%
no opinion	**0**	0%

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



Above satisfactory	**31**	57%
Satisfactory	**23**	43%
Below satisfactory	**0**	0%
no opinion	**0**	0%

Was there adequate time between lectures for discussion?



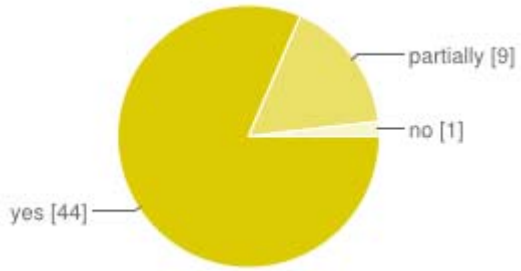
Above satisfactory	**32**	59%
Satisfactory	**22**	41%
Below satisfactory	**0**	0%
no opinion	**0**	0%

Additional comments on the topic presentation and organization

It is wonderful the second talk on the first day was more of a research talk than an introductory talk With the exception of the minicourse the talks were extremely specialized. Perhaps speakers shou ...

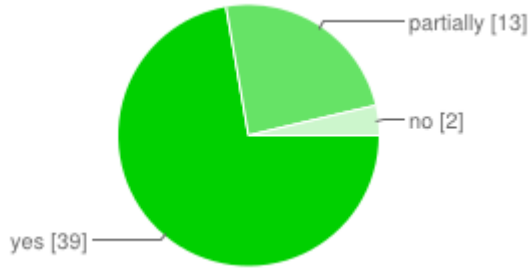
Personal assessment

Was your background adequate to access a reasonable portion of the material?



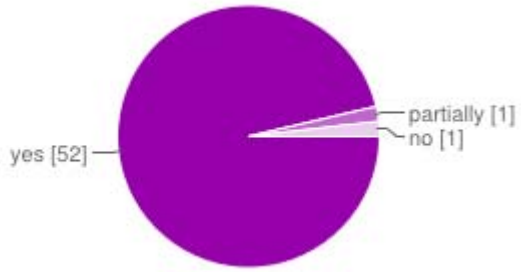
yes	**44**	81%
partially	**9**	17%
no	**1**	2%

Did the workshop increase your interest in the subject?



yes	**39**	72%
partially	**13**	24%
no	**2**	4%

Was the workshop worth your time and effort?



yes	**52**	96%
partially	**1**	2%
no	**1**	2%

Additional comments on your personal assessment

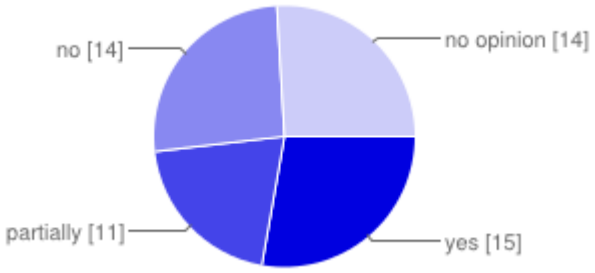
The lectures on Cluster Algebras were more accessible than the ones in Commutative Algebra.

The latter were directed mainly to specialists, it seems; a pity.

The talks really help me to understand m ...

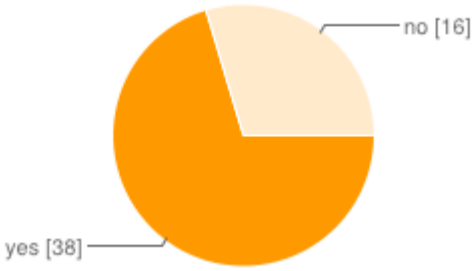
Additional Activities

Did you find the poster sessions beneficial?



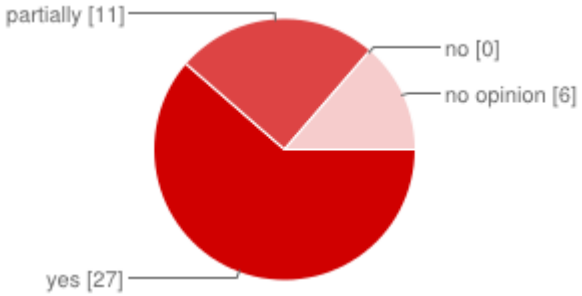
yes	**15**	28%
partially	**11**	20%
no	**14**	26%
no opinion	**14**	26%

Did you attend the panel discussion?



yes	**38**	70%
no	**16**	30%

If you did attend the panel discussion, did you find it beneficial?



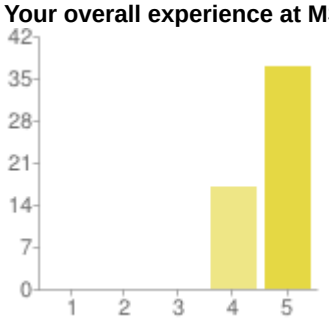
yes	**27**	50%
partially	**11**	20%
no	**0**	0%
no opinion	**6**	11%

What other subjects should be addressed in future panel discussions?

Hold the panel discussion earlier - it stimulates discussion. Probably it's best just to let things flow freely. This worked here and it should work in the future. If it is important for faculty to k ...

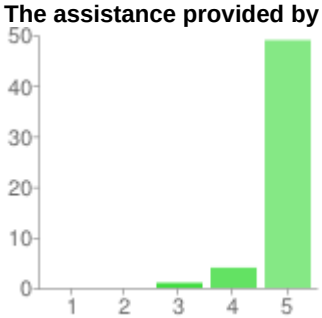
Venue

Your overall experience at MSRI



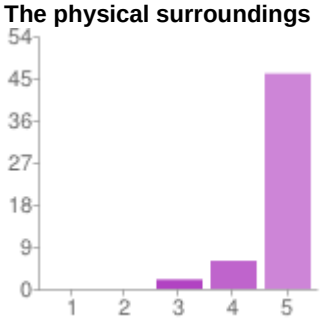
1 -Not satisfactory	**0**	0%
2	**0**	0%
3	**0**	0%
4	**17**	31%
5 -Above satisfactory	**37**	69%

The assistance provided by MSRI staff



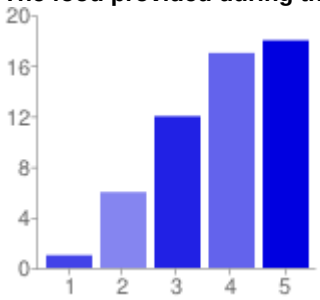
1 -Not satisfactory	**0**	0%
2	**0**	0%
3	**1**	2%
4	**4**	7%
5 -Above satisfactory	**49**	91%

The physical surroundings



1 -Not satisfactory	**0**	0%
2	**0**	0%
3	**2**	4%
4	**6**	11%
5 -Above satisfactory	**46**	85%

The food provided during the workshop



Not satisfactoryAbove satisfactory

1 -Not satisfactory	**1**	2%
2	**6**	11%
3	**12**	22%
4	**17**	31%
5 -Above satisfactory	**18**	33%

Additional comments on the venue

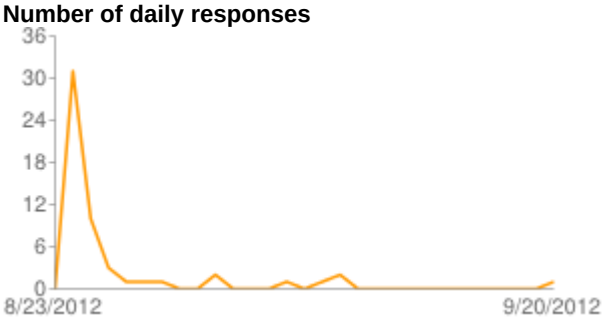
I hope workshops in future will provide more kinds of food. wow! what a view in every direction! I believe the food offerings should be more considerate of participants dietary restrictions and pref ...

Thank you for completing this survey

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

It was great experience and I did enjoy this workshop a lot. Thank you for everything. The only reason I felt the poster session was not beneficial was that there were so few posters and too many people. It would have been better if more people were presenting posters. It would have spread the attendees out and given us a chance to visit with the presenters. Overall, I've had a very positive experience at MSRI. This is my first time here, and I would definitely like to attend an MSRI workshop again.

Number of daily responses



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Additional Survey Responses

Additional comments on the topic presentation and organization

- It is wonderful
- the second talk on the first day was more of a research talk than an introductory talk
- With the exception of the minicourse the talks were extremely specialized. Perhaps speakers should be asked to give more of a colloquium-style talk in the future, especially when a diverse audience is expected.
- I am very happy to say I never expected such an incredible experience getting to meet so many wonderful people from staff to students to mathematicians. Thank you.
- Cluster talks were much more appropriate for a broad audience (I'm a commutative algebraist, and got more from the cluster talks).
- A few of the speakers assumed a bit too much on the part of the audience, particularly in view of the fact that people were coming from two rather different backgrounds. Several other speakers (from both camps) did spectacularly well in selling the subject and making it accessible to the "other camp".
- The mini course together with the exercise session were excellent.
- There was a good attempt to introduce cluster algebras, but the introductory lectures did not lead naturally to the lectures on Friday (although those lectures were very helpful for me personally).
- great to have a lot of time between lectures, to discuss
- Some of the research talks were too difficult
-

Additional comments on your personal assessment

- The lectures on Cluster Algebras were more accessible than the ones in Commutative Algebra. The latter were directed mainly to specialists, it seems; a pity.
- The talks really help me to understand more!
- As a commutative algebraist, I was ignorant of cluster algebras and cluster categories, but now I have some insight into how they relate to several aspects of my own work.
- The talks on Cluster Algebras were generally very accessible and enjoyable (especially Lauren Williams's minicourse). I had a really hard time with the commutative algebra research talks. Why so elementary with cluster algebras and so advanced with commutative algebra?
- the panel discussion was great!!! I (a guy) got several insights in what it's like to be a female mathematician.

Additional comments on the venue

- I hope workshops in future will provide more kinds of food.
- wow! what a view in every direction!
- I believe the food offerings should be more considerate of participants dietary restrictions and preferences.
- Have some sugar-free food.
- New (ish) caterer is much much better than several years ago. The location is wonderful as always.

- Hard to beat!
- very beautiful!
- MSRI is a wonderful place. Food a bit pricy.
- The snacks provided by MSRI are great but the catering needs more variety.

What other subjects should be addressed in future panel discussions?

- Hold the panel discussion earlier - it stimulates discussion.
- Probably it's best just to let things flow freely. This worked here and it should work in the future.
- If it is important for faculty to know about non-academic jobs and those which are academic but not necessarily as a professor. By know about I mean being able to guide theirs students towards those directions.
- the panel discussion was great!!! I (a guy) got several insights in what it's like to be a female mathematician.
-

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

- It was great experience and I did enjoy this workshop a lot. Thank you for everything.
- "The only reason I felt the poster session was not beneficial was that there were so few posters and too many people. It would have been better if more people were presenting posters. It would have spread the attendees out and given us a chance to visit with the presenters.

  Overall, I've had a very positive experience at MSRI. This is my first time here, and I would definitely like to attend an MSRI workshop again."