

# **Connections for Women: An Introduction to Random Matrices**

September 20 to 21, 2010  
MSRI, Berkeley, CA, USA

Organizers:

**Estelle Basor (American Institute of Mathematics, Palo Alto)**

**Alice Guionnet\* (Ecole Normale Supérieure de Lyon)**

**Irina Nenciu (University of Illinois at Chicago)**

Parent Program:

**Statistical Challenges for Meta-Analysis of Medical and Health-Policy Data**

# Report on the ‘Connection for women: workshop on random matrices’

September 20-21, 2010

## **Organizers**

- Estelle Basor, American Institute of Mathematics, Palo Alto
- Alice Guionnet, ENS Lyon
- Irina Nenciu, MSCS, UIC, Chicago

One of the aims of this workshop was to present basic notions from random matrix theory, with a particular focus on providing background material so that all participants can interact successfully with more experienced and senior researchers involved in the program. Many of the senior participants are experts in one area of random matrix theory and have less familiarity with techniques and results from other related topics. This workshop broadened the knowledge of all participants so that they could interact with all aspects of the parent program.

Random Matrix Theory (RMT) started in the twenties with the work of Wishart in multivariate analysis. It developed in theoretical physics after Wigner and Dyson used random matrices as an approximation of the Hamiltonian of highly excited nuclei. After the work of 't Hooft in the seventies, it became a central tool to tackle QCD, string theory and hard combinatorial questions. At about the same time, Montgomery conjectured that the non trivial zeroes of the Riemann Zeta function are related with the eigenvalues of large random matrices. Since that time an extraordinary variety of mathematical, physical and engineering systems have been related with RMT; it has emerged as an interdisciplinary scientific activity par excellence.

Since random matrix theory has been found to be such an important model for so many topics in mathematics and physics we wanted to highlight as much of the basic areas as possible.

Topics covered in this workshop included fundamental problems in random matrices. We had eight one hour talks, which provided background materials in active research areas. More precisely, the themes which were represented were universality questions (Sandrine Péché), connections with integrable systems and PDE's (Tamara Grava and Irina Nenciu) and with large random graphs

(Ioana Dumitriu and Maria Scherbina), non-normal matrices (Alice Guionnet) and the effect of finite rank perturbation on the spectrum of random matrices (Mireille Capitaine and Mylene Maida). Mireille Capitaine and Alice Guionnet talks both emphasized the use of free probability to analyze the spectrum of random matrices.

We had four talks each day with ample time for discussion between the talks. The talks were well attended by the participants in the parent program and the participants of the first workshop. Many of the participants of the connection workshop were able to come to MSRI a few days or even a week before the connection workshop and thus also attended the week long introductory workshop.

We organized a panel session on the first evening, which discussed the role and obstacles facing women in mathematica careers. The dinner on the first evening was very successful with more than twenty women attending and many open discussions.

### Invited Speakers

firstname	lastname	institutionname
Mireille	Capitaine	Centre National de la Recherche Scientifique (CNRS)
Ioana	Dumitriu	University of Washington
Tamara	Grava	International School for Advanced Studies (SISSA/ISAS)
Alice	Guionnet	Ecole Normale Supérieure de Lyon
Mylene	Maida	Université de Paris XI (Paris-Sud)
Irina	Nenciu	University of Illinois
Sandrine	Péché	Université de Grenoble I (Joseph Fourier)
Mariya	Shcherbyna	National Academy of Sciences of Ukraine

<b>Schedule</b>		
<b>Monday September 20, 2010</b>		
09:25AM - 09:40AM	Welcome	
09:40AM - 10:40AM	Sandrine Péché	Universality in the bulk of the spectrum for Hermitian random matrices
10:40AM - 11:10AM	Tea	
11:10AM - 12:10PM	Irina Nenciu	TBD
12:10PM - 02:00PM	Lunch	
02:00PM - 03:00PM	Tamara Grava	Universality results for hamiltonian perrturbations of Hamiltonian PDEs: the 2 component case
03:00PM - 03:30PM	Tea	
03:30PM - 04:30PM	Mylene Maida	Fluctuations and Large Deviations for Extreme Eigenvalues of Deformed Random Matrices
04:35PM - 05:45PM	Panel (Commons)	
<b>Tuesday September 21, 2010</b>		
09:30AM - 10:30AM	Ioana Dumitriu	Sparse regular random graphs: spectral density and eigenvectors
10:30AM - 11:00AM	Tea	
11:00AM - 12:00PM	Alice Guionnet	The Single Ring Theorem
12:00PM - 02:00PM	Lunch	
02:00PM - 03:00PM	Mireille Capitaine	Free convolution with a semi-circular distribution and eigenvalues of spiked deformations of Wigner matrices
03:00PM - 03:30PM	Tea	
03:30PM - 04:30PM	Mariya Shcherbyna	Central limit theorem for linear eigenvalue statistics of diluted random matrices

**Officially Registered Participants**

firstname	lastname	institutionname
Jinho	Baik	University of Michigan
Estelle	Basor	American Institute of Mathematics
Dan	Betea	California Institute of Technology
Tristram	Bogart	University of Washington
Lorna	Brightmore	Department of Mathematics, University of Bristol
Branimir	Cacic	California Institute of Technology, Department of Mathematics
Mireille	Capitaine	Centre National de la Recherche Scientifique (CNRS)
Yang	Chen	Imperial College, London
Ivan	Corwin	New York University
Kim	Dang	Universität Zürich
Alfredo	Deaño	Universidad Carlos III de Madrid
Catherine	Donati	Centre National de la Recherche Scientifique (CNRS)
Ioana	Dumitriu	University of Washington
Nicholas	Ercolani	University of Arizona
Avivith	Fischmann	Queen Mary and Westfield College
dalit	gafni	the college of management academic studies
Dries	Geudens	Katholieke Universiteit Leuven
Tamara	Grava	International School for Advanced Studies (SISSA/ISAS)
Alice	Guionnet	Ecole Normale Supérieure de Lyon
Adrien	Hardy	Katholieke Universiteit Leuven
Joanna	Hutchinson	University of Bristol
Maria	Jivulescu	Technical University of Timisoara
Anna	Kononova	Baltic State Technical University
Arnoldus	Kuijlaars	Katholieke Universiteit Leuven
Anna	Lytova	B.Verkin Institute for Low Temperature Physics and Engineering
Mylene	Maida	Université de Paris XI (Paris-Sud)
Camille	Male	UMPA - Ens lyon
Zeinab	Mansour	King Saud University
Fatemeh	Mohammadi	Ferdowsi University of Mashhad
Irina	Nenciu	University of Illinois
Josh	Oyoung	University of California
Sandrine	Péché	Université de Grenoble I (Joseph Fourier)
Carmelita	Ragasa	University of the East Manila
Emily	Redelmeier	Queens University
David	Renfrew	University of California
Brigitte	Servatius	Worcester Polytechnic Institute

Tatyana	Shcherbina	National Academy of Sciences of Ukraine
Mariya	Shcherbyna	National Academy of Sciences of Ukraine
Nicholas	Simm	University of Bristol
Vidya	Venkateswaran	California Institute of Technology
Mirjana	Vuletic	Brown University
MANAN	VYAS	Physical Research Laboratory
Zhen	Wei	University of Virginia
Jacob	White	Arizona State University
Manwah	Wong	Georgia Tech School of Mathematics
Zhe	Xu	University of California
Benjamin	Young	McGill University
Anna	Zemlyanova	Texas A & M University

### Officially Registered Participant Information

<b>Participants</b>		<b>48</b>
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<b>Gender</b>		<b>48</b>
<b>Male</b>	35.42%	17
<b>Female</b>	60.42%	29
<b>Declined to state</b>	4.17%	2

<b>Ethnicity*</b>		<b>49</b>
<b>White</b>	67.35%	33
<b>Asian</b>	24.49%	12
<b>Hispanic</b>	2.04%	1
<b>Pacific Islander</b>	0.00%	0
<b>Black</b>	0.00%	0
<b>Native American</b>	0.00%	0
<b>Declined to state</b>	6.12%	3

\* ethnicity specifications are not exclusive

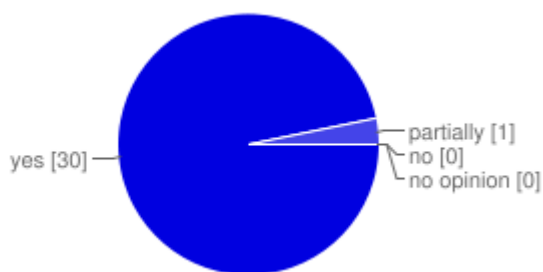


# 31 [responses](#)

## Summary [See complete responses](#)

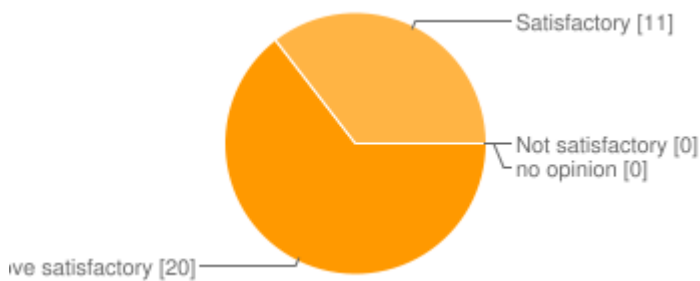
### Topic presentation and organization

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



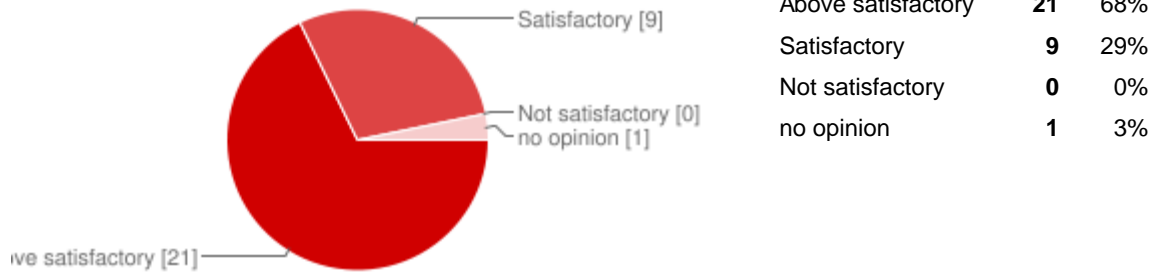
yes	<b>30</b>	97%
partially	<b>1</b>	3%
no	<b>0</b>	0%
no opinion	<b>0</b>	0%

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



Above satisfactory	<b>20</b>	65%
Satisfactory	<b>11</b>	35%
Not satisfactory	<b>0</b>	0%
no opinion	<b>0</b>	0%

Was there adequate time between lectures for discussion?

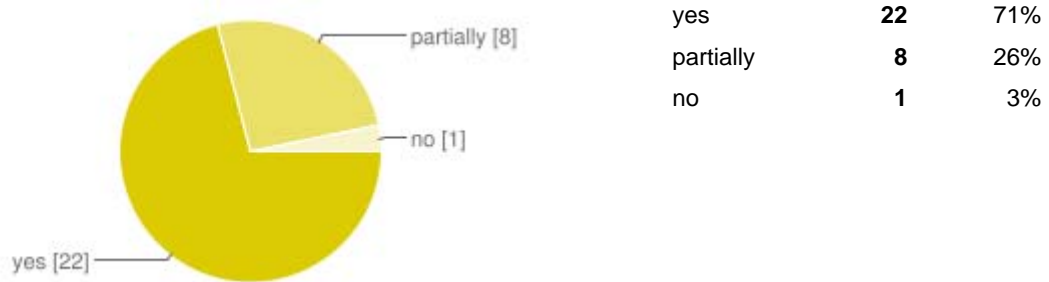


**Additional comments on the topic presentation and organization**

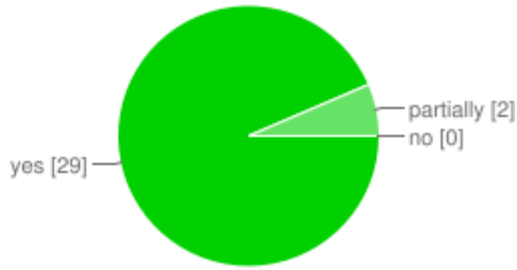
Very nice format The topics were interesting. It would be better if some basic introduction to the topics be given before all the speakers presented their paper. The introduction may also include the ...

**Personal assessment**

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

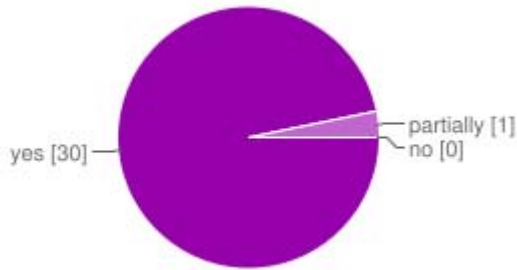


**Did the workshop increase your interest in the subject?**



yes	<b>29</b>	94%
partially	<b>2</b>	6%
no	<b>0</b>	0%

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



yes	<b>30</b>	97%
partially	<b>1</b>	3%
no	<b>0</b>	0%

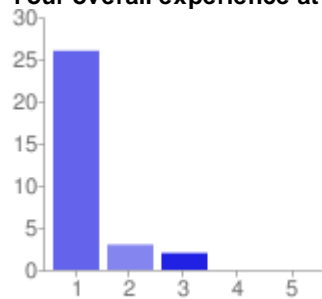
**Additional comments on your personal assessment**

great inspiration

for my phd-thesis, this workshop was a

**Venue**

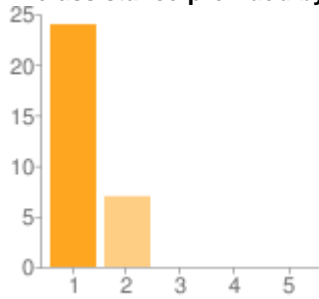
**Your overall experience at MSRI**



1 - Above satisfactory	<b>26</b>	84%
2	<b>3</b>	10%
3	<b>2</b>	6%
4	<b>0</b>	0%
5 - Not satisfactory	<b>0</b>	0%

Above satisfactory Not satisfactory

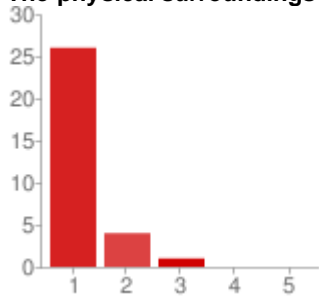
**The assistance provided by MSRI staff**



1 - Above satisfactory	<b>24</b>	77%
2	<b>7</b>	23%
3	<b>0</b>	0%
4	<b>0</b>	0%
5 - Not satisfactory	<b>0</b>	0%

Above satisfactory Not satisfactory

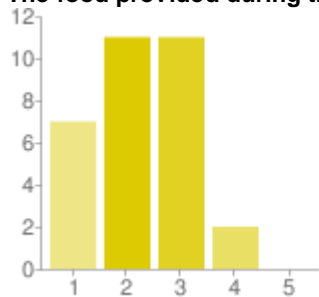
**The physical surroundings**



1 - Above satisfactory	<b>26</b>	84%
2	<b>4</b>	13%
3	<b>1</b>	3%
4	<b>0</b>	0%
5 - Not satisfactory	<b>0</b>	0%

Above satisfactory Not satisfactory

**The food provided during the workshop**



1 - Above satisfactory	<b>7</b>	23%
2	<b>11</b>	35%
3	<b>11</b>	35%
4	<b>2</b>	6%
5 - Not satisfactory	<b>0</b>	0%

Above satisfactory Not satisfactory

**Additional comments on the venue**

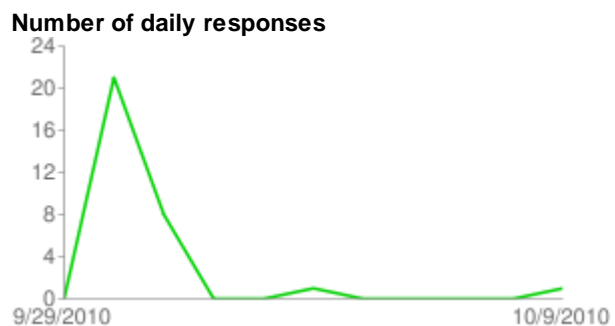
room, and was difficult to see from further back or the sides.

Auditorium projector screen was too small for the

**Thank you for completing this survey**

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

Would have liked more time between the end of the first day and the conference meal. I think enough time should be left so people don't need to arrive with all their notes and things from the day!



# **Connections for Women: An introduction to Random Matrices**

## **Additional Survey Responses**

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

- Very nice format
- It would be better if some basic introduction to the topics be given before all the speakers presented their paper. The introduction may also include the background of the speakers.
- one hour talks and introductions are very convenient

### **Additional comments on the venue**

- Auditorium projector screen was too small for the room and was difficult to see from further back or the sides

### **Additional comments on your personal assessment**

- For my phd-thesis, this workshop was a great inspiration

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

- Would have liked more time between the end of the first day and the conference meal. I think enough time should be left so people don't need to arrive with all their notes and things from the day!