MEASUREMENT AT THE CROSSROADS
HISTORY, PHILOSOPHY AND SOCIOLOGY OF MEASUREMENT

27 > 29 JUNE 2018
ENSA Paris-Val de Seine | Amphithéâtre 310
3 quai Panhard et Levassor | Paris 13e

ROUND TABLE
TOWARDS A NEW INTERNATIONAL SYSTEM OF UNITS
27 JUNE | 17h > 18h30

KEYNOTE SPEAKERS
Karine Chemla | CNRS, SPHERE, France
Wendy Parker | Durham University, United Kingdom
Oliver Schlaudt | Heidelberg University, Germany
Eran Tal | McGill University, Canada

ORGANIZERS
Nadine de Courtenay | University Paris Diderot, SPHERE, France
Fabien Grégis | Tel Aviv University, Israel & SPHERE, France
Christine Proust | CNRS & University Paris Diderot, SPHERE, France

website | https://measurement2018.sciencesconf.org/
contact | measurement2018@sciencesconf.org

univ-paris-diderot.fr
Measurement at the Crossroads is the third interdisciplinary conference to explore the history and philosophy of measurement after Dimensions of Measurement in Bielefeld (2013) and The Making of Measurement in Cambridge (2015). The conference will bring together historians, philosophers, and sociologists of science to address questions related to measurement across disciplines ranging from the natural sciences to the life and human sciences.

The recent revival of the philosophy of measurement in the early 2000s appears to be instrumental in overcoming the tensions that obstructed science studies during much of the second half of the twentieth century. The Paris conference aspires to promote the new ways of addressing issues of quantification and measurement that are now emerging and promising to bridge the various gulfs – theoretical versus practical, descriptive versus normative – that have divided the philosophical, historical and sociological approaches to science. It is now recognized that questions of quantification transcend the earlier focus on meaning and representation which formerly attracted the attention of philosophers of science, and that these questions benefit from investigation alongside the means and processes that enable scientists, and human agents in general, to agree on their measurement results and make them reliable bases for decision and action. The resulting shift of attention towards the uses of measurement results in inference and prediction places the new agenda of philosophy of measurement at the crossroads of conceptual, epistemic, historical, material, technological and institutional issues.

The 2018 conference comes at a time when the field of metrology is about to reach an important turning point with the reform of the International System of Units (SI) that is to be announced by the end of 2018. With Measurement at the Crossroads we aspire to connect the discussions developing in the emerging field of history and philosophy of measurement with some of the issues arising from this major reshaping of the field of metrology. Special attention will thus be given to issues pertaining to the formation of systems of units and standards, as well as to related institutional matters. The conference will build upon the two former ones by inscribing these issues more explicitly in a world-wide and a long-term perspective. In addition to the enquiries related to the contemporary SI reform, time will therefore be allotted for studies concerned with how measurement units have been worked out in the past, from Antiquity to today’s reform, in different regions of the world. This will offer a cultural-anthropological outlook on metrology.
Programme committee

- Mieke Boon (University of Twente, Netherlands)
- Marcel Boumans (Utrecht University, Netherlands)
- Thomas Coudreau (University Paris Diderot, France)
- Olivier Darrigol (CNRS, SPHERE, France)
- Noël Dimarcq (CNRS, Observatoire de Paris, France)
- Marie Gaille (CNRS, SPHERE, France)
- Giora Hon (University of Haifa, Israel)
- Matthieu Husson (CNRS, Observatoire de Paris, France)
- Shaul Katzir (Tel Aviv University, Israel)
- Alain Leplège (University Paris Diderot, France)
- Alexandre Mallard (Mines ParisTech, France)
- Luca Mari (University Cattaneo, Italy)
- Alfred Nordmann (Technical University of Darmstadt, Germany)
- Theodore Porter (University of California, Los Angeles, USA)
- Léna Soler (University of Lorraine, France)
- John Steele (Brown University, USA)
- Mark Wilson (University of California, Berkeley, USA)

Organizing committee

- Thomas Coudreau (University Paris Diderot, France)
- Nadine de Courtenay (University Paris Diderot, France)
- Patrice Delon (SPHERE, University Paris Diderot, France)
- Justin Gabriel (SPHERE, University Paris Diderot, France)
- Fabien Grégis (Tel Aviv University & SPHERE)
- Sarah Hijmans (University Paris Diderot, France)
- Jan Lacki (University of Geneva)
- Christine Mousset (University Paris Diderot, France)
- Christine Proust (CNRS, SPHERE, France)
- Youna Tonnerre (University Rennes 1 & University Paris Diderot, France)

Organizers

- Nadine de Courtenay (University Paris Diderot, France)
- Fabien Grégis (Tel Aviv University & SPHERE)
- Christine Proust (CNRS, SPHERE, France)

Support

- Poster: Sandra Cochin
- Booklets: David Feltz
- Logo: Laurane Travagli-Chanal
Programme
École nationale supérieure d'architecture de Paris-Val de Seine (ENSA PVS) **Amphitheatre 310**
3-15 Quai Panhard et Levassor, 75013 Paris

**University Paris Diderot, Condorcet building**
**Luc Valentin 454A / Malevitch 483A / Mondrian 646A**
Entry 1 : 10 rue Alice Domon et Léonie Duquet, 75013 Paris
Entry 2: 4 rue Elsa Morante, 75013 Paris

- **WIFI Condorcet**: Individual access only for registered participants
- **WIFI ENSA PVS**: Information at the end of this booklet
- **Phone contact in case of emergency:**
  - Justin Gabriel: +33 (0)6 76 21 48 93
  - Christine Proust: +33 (0)6 79 13 69 82
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<thead>
<tr>
<th>Time</th>
<th>Wednesday 27</th>
<th>Thursday 28</th>
<th>Friday 29</th>
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<tbody>
<tr>
<td>08:15</td>
<td>Welcoming coffee*</td>
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<td>08:45</td>
<td>Introduction*</td>
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<td>Eran TAL</td>
<td>Wendy PARKER</td>
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# Wednesday 27

## 08:15 – 08:45  Welcoming coffee and registration
Amphitheatre 310 (Ecole Nationale Supérieure d’Architecture, ENSA PVS)

## 08:45 – 09:00 Introduction  Amphitheatre 310 (ENSA PVS)
Nadine de Courtenay, Fabien Grégis, Christine Proust & the organizing committee

### 09:00 – 10:30  Amphitheatre 310 (ENSA PVS)

| Keynote lecture 1  | Chair: Fabien Grégis  (Tel Aviv University)  
|--------------------|-----------------------------------------------|
| Eran Tal  (McGill University)  
Measurement, Prediction and Coherence |

### 10:30-11:00 Coffee break  Amphitheatre 310 (ENSA PVS)

## Panel 1 (symposium)  Computation and Measurement at the Large Hadron Collider: Managing complexity in high energy physics experiments  Chair: Thomas Coudreau  (University Paris Diderot)

| Sophie Ritson  (Alpen-Adria Universität Klagenfurt)  
| Measurement and machine learning at the Large Hadron Collider (LHC): the Higgs selfcoupling as a case study |
| Michael Heidelberger  (Eberhard Karls Universität Tübingen)  
| Ernst Mach’s theory of measurement |
| Aashish Velkar  (University of Manchester)  
| The Cultural and economic consequences of global metrological standardisation |

### Panel 2  Historical foundations of the philosophy of measurement  Chair: Nadine de Courtenay  (University Paris Diderot)

| Florian Boge  (Bergische Universität Wuppertal)  
| How to infer from simulated measurements? |
| Francesca Biagioli  (University of Vienna)  
| Hermann von Helmholtz and the quantification problem of psychophysics |
| Rebecca Jackson  (Indiana University)  
| “The Uncertain method of drops”: How a non-uniform fluid unit survived the century of standardization |

### Panel 3  Standardization at issue  Chair: Youna Tonnerre  (University Rennes 1 & University Paris Diderot)

| Paul Grünke  (Karlsruher Institut für Technologie)  
| The epistemic status of experimental measurements involving computer simulations |
| Pablo Acuña  (Pontificia Universidad Católica de Valparaiso)  
| Measuring the Epistemology of Geometry |
| Edward Gillin  (University of Cambridge)  
| Mathematicians, musicians, and the measurement of musical pitch in mid-Victorian Britain |

## 11:00  Luc Valentin 454A  Malevitch 483A  Mondrian 646A

| Sophie Ritson  (Alpen-Adria Universität Klagenfurt)  
| Measurement and machine learning at the Large Hadron Collider (LHC): the Higgs selfcoupling as a case study |
| Michael Heidelberger  (Eberhard Karls Universität Tübingen)  
| Ernst Mach’s theory of measurement |
| Aashish Velkar  (University of Manchester)  
| The Cultural and economic consequences of global metrological standardisation |

## 11:40  Luc Valentin 454A  Malevitch 483A  Mondrian 646A

| Florian Boge  (Bergische Universität Wuppertal)  
| How to infer from simulated measurements? |
| Francesca Biagioli  (University of Vienna)  
| Hermann von Helmholtz and the quantification problem of psychophysics |
| Rebecca Jackson  (Indiana University)  
| “The Uncertain method of drops”: How a non-uniform fluid unit survived the century of standardization |

## 12:20  Luc Valentin 454A  Malevitch 483A  Mondrian 646A

| Paul Grünke  (Karlsruher Institut für Technologie)  
| The epistemic status of experimental measurements involving computer simulations |
| Pablo Acuña  (Pontificia Universidad Católica de Valparaiso)  
| Measuring the Epistemology of Geometry |
| Edward Gillin  (University of Cambridge)  
| Mathematicians, musicians, and the measurement of musical pitch in mid-Victorian Britain |

## 13:00-14:30: Lunch break – Restaurant
## Wednesday 27

### Panel 4
**Measurement, Intersubjectivity, and trust**
Chair: Fabien Grégis (Tel Aviv University)

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**Intersubjectivity of measurement across the sciences: Unit definition and dissemination**

Andrew Maul (University of California, Santa Barbara), Mark Wilson (University of California, Berkeley), Luca Mari (Università Cattaneo)

- Does the coordination problem exist: Measurement in neuroimaging
- The Evolution of face validity from inception to reinstatement
- Blending objectivity and subjectivity in measurement: Benjamin Wright's personal approach to learning
- Measuring fatness and its hazards: Precision adipometry versus a 1950s public health campaign against obesity

### Roundtable: Towards a New International System of Units
Chair: Thomas Coudreau (University Paris Diderot)

- Christian Bordé (Académie des sciences, CNRS)
- Richard Davis (International Bureau of Weights and Measures)
- Marc Himbert (Conservatoire National des Arts et Métiers)
- Estefania de Mirandés (International Bureau of Weights and Measures)
- François Piquemal (Laboratoire National de Métrologie et d'Essais)
- Eran Tal (McGill University)

### 18:30-20:00 Cocktail reception
Amphitheatre 310 (ENSA PVS), cafeteria
<table>
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| 09:00 – 10:30 | Keynote lecture 2  
  **Chair:** Nadine de Courtenay (University Paris Diderot)  
  **Wendy Parker** (Durham University): Measuring via computer simulation?                                                                 |
| 10:30-11:00 | Coffee break                                                                                                                                  |
| 11:00      | **Panel 7**  
  Investigating models of social measurement  
  **Chair:** Alain Leplège (University Paris Diderot)  
  Leslie Pendril, Jeanette Melin (Research institutes of Sweden, Metrology)  
  Stefan Cano (Modus Outcomes)  
  Theresa Köbe (Charité - University Medicine Berlin)  
  Restitution of ability and difficulty from decision making: the metrology of human-based perceptions |
| 11:40      | **Panel 8**  
  The Making of instruments and standards of measurement  
  **Chair:** Jan Lacki (University of Geneva)  
  Ariane Fillmer (Physikalisch-Technische Bundesanstalt)  
  Liqun Zhou (Beijing Foreign Studies University & Needham Research Institute, Cambridge)  
  A DIY water clock (clepsydra) from a Chinese text of Yuan dynasty |
| 12:20      | **Panel 9**  
  Managing data: Three studies  
  **Chair:** Sarah Hijmans (University Paris Diderot)  
  David Leal, Mesbah Khan, Hayden Atkinson, Andrew Mitchell (University of Westminster)  
  Explaining measurements to machines |
| 13:00      | Lunch break - Buffet                                                                                                                               |

- **Luc Valentin 454A**
- **Malevitch 483A**
- **Mondrian 646A**
- **A. Jan Kutylowski** (University of Oslo)  
  Measurement and modelling of categorical variables in the sociosciences: a comparison of traditional and modern approaches, with prospects for the future
- **Eckhard Wallis** (Institut de Mathématiques de Jussieu, Paris Rive Gauche)  
  Making clocks – Research at the Laboratoire de l’Horloge Atomique during the 1960s
- **Jean-Pierre Llored** (Université Paris Diderot)  
  Investigating measurement: The case of chemical metrology
- **Jennifer Egloff** (Zayed University)  
  Artisans' resistance to geometrical measurement techniques in the Early Modern English Atlantic: Challenging the persistent notion of linear change in mathematics
# Thursday 28

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<th>Time</th>
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<th>Panel 11</th>
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<td>14:00</td>
<td>Amphitheatre 310 (ENSA PVS)</td>
<td>Theory dependence, models, and idealization in measurement</td>
<td>Errors of measurement in historical perspective</td>
<td>Measurement issues in the life sciences</td>
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<td>Chair: Theodore Porter (University of California, L.A.)</td>
<td>Chair: Giora Hon (University of Haifa)</td>
<td>Chair: Céline Lefève (University Paris Diderot)</td>
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<td>14:00 – 18:30</td>
<td>Amphitheatre 310 (ENSA PVS)</td>
<td>Kent Staley (Saint Louis University)</td>
<td>Robert Middeke-Conlin (Max Planck Institute for the History of Science)</td>
<td>Nádia Jardim (University of Lisbon)</td>
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<td>An epistemological function for systematic uncertainty in measurements in high energy physics</td>
<td>The limits of measured value in Ancient Mesopotamia</td>
<td>Measuring body functions at the turn of the 19th Century through serial photography and cinema</td>
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<td>14:40</td>
<td>Amphitheatre 310 (ENSA PVS)</td>
<td>Alessandro Giordani (Università Cattolica del Sacro Cuore di Milano)</td>
<td>Luca Mari (Università Cattaneo)</td>
<td>Qiu Lin (Duke University)</td>
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<td>On theory dependence of truth in measurement</td>
<td>Idealization and Measurement: A Comparative Case Study</td>
<td>George Borg (University of Pittsburgh)</td>
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<td>Roman Zdzislaw Morawski (Warsaw University of Technology)</td>
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<td>Measurement as abduction</td>
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<td>Maarten Bullynck (Université Paris VIII &amp; SPHERE, Paris)</td>
<td>Daniel Ott (University of Cambridge)</td>
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<td>The fine distinctions of error. Getting knowledgeable about errors at the crossroads of theory, instrument and observation</td>
<td>Can pain be measured? Emerging technologies, epistemological uncertainty, and pragmatic realism</td>
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<td>16:30-17:00</td>
<td>Coffee break</td>
<td>17:00 – 18:30</td>
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<td>21:00 Conference dinner – Restaurant</td>
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## Friday 29

### Panel 14 (symposium)

**The measurement of nonquantitative properties in the human sciences**

**Chair:** Mark Wilson  
(University of California, Berkeley)

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| **Joshua McGrane**  
(University of Oxford) | **Matthias Neuber**  
(University of Tübingen) | **Daniel Jon Mitchell**  
(Rheinisch-Westfälische Technische Hochschule Aachen) |
| An inclusive conception of measurement for the human sciences minus the philosophical baggage | Helmholtz, Kaila, and the Representational theory of measurement | The second quantification of physics |

### Panel 15

**Reconsidering the Representational theory of measurement**

**Chair:** Michael Heidelberger  
(University of Tübingen)

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| **Trisha Nowland**  
(Macquarie University) | **Jean Baccelli**  
(Munich Center for Mathematical Philosophy) | **Frans Van Lunteren**  
(Vrije Universiteit, Amsterdam) |
| Rough set theory for psychometric research: A modest proposal | Beyond the metrological viewpoint | The International Bureau of Weights and Measures and the politics of science |

### Panel 16

**Constructing measurement: quantifications, institutions, and numerical notations**

**Chair:** Nadine de Courtenay  
(University Paris Diderot)

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| **Alex Scharaschkin**  
(University of Oxford) | **Pierre Uzan**  
(SPHERE, Paris) | **Qiu Gaoxing**  
(China Jiliang University) |
| Measurement without quantification? The case of educational assessment | From measurement-representation to measurement as a semantic act | Imperial notation and Bodhisattva notation - Illustrated by the example of Avatamsaka Sutra |

### 11:00-11:30: Coffee break

Amphitheatre 310 (ENSA PVS)

### 11:30 – 13:00

**Keynote lecture 4**  
**Chair:** Emmanuel Didier  
(ENS, CNRS & EHESS)

**Oliver Schlaudt**  
(University of Heidelberg)

“Who is there that doesn’t calculate?”  
The homo economicus as a measuring instrument

### 13:00 Closing
Connection to the WIFI network of ENSA Paris-Val de Seine

1. Choose the ENSAPVS network Guest
2. A page called "Log in / Welcome to ENSAPVS Guest » should open automatically. If not open any website page in your internet browser.
3. At the bottom of the "Log In" page choose "Create an account" (in blue)
4. Fill in the fields and validate
5. Go to your email account to VALIDATE the login link **within 10 minutes**
Access by public transport:
- Underground line 14, RER C: station Bibliothèque François Mitterrand.
- Metro Line 6, station Quai de la Gare (10 minutes walk).
- Bus: 62, 89 / Stop: Bibliothèque rue Mann; 64: Bibliothèque François Mitterrand; 325: Watt.

Practical information:
- Restaurant (Wednesday 27): Dans la Cuisine, 54-56 avenue de France, 75013 Paris
- Restaurant (Thursday 28): Bouillon Racine, 3 Rue Racine, 75006 Paris
- Phone contact in case of emergency:
  - Justin Gabriel: +33 6 76 21 48 93
  - Christine Proust: +33 6 79 13 69 82