

**How Do We Decide What to Measure?** A workshop on measurement practice in life sciences and medicine at CBD

Organized by David Houle (FSU) and Christophe Pélabon (CBD) at CBD 7<sup>th</sup> to 9<sup>th</sup> of June 2017



**Context**

Measurement is the process by which we assign numbers to attributes of entities so that the mathematical relationship among numbers captures empirical relationships among the attributes of interest. Only appropriate measurements and analyses that respect the nature of the measurements can lead to correct conclusions about the world. While the process of measurement has received a great deal of attention in physics, actual measurement practices in biology frequently falls short of the ideal, leading to incorrect conclusions that can derail fields for years. The organizers have explored these issues in the field of evolutionary biology, and documented many cases of such mismeasurement and the damage it can do. Although awareness of these problems has emerged in the past years, there is still place for progress.

To assess the generality of measurement issues in biology, we are organizing a workshop to explore measurement practice in several fields in life sciences and medicine. We are recruiting leading practitioners in areas such as biomedical research, community ecology, behavior and molecular biology who are willing to explain the measurement choices that they and others make, and to discuss whether lapses in measurement practice hamper good science in their fields.

Each invited participant will make an initial presentation to a diverse audience, followed by discussions among the invited participants that investigate commonalities and differences in measurement practices, and whether we can agree on a common approach that can promote better measurement. In order to facilitate the discussions, we will ask the speakers and other invited participants to identify in advance possible issues related to measurements in their fields.

The workshop will start with plenary lecture on the 7<sup>th</sup> of June Morning. It will be followed by working sessions with invited participants and members of CBD who wish to participate (please contact C. Pélabon if you wish to participate to the working sessions: [Christophe.pelabon@ntnu.no](mailto:Christophe.pelabon@ntnu.no)).

**Wednesday 7**

8:30 Opening of Meeting D Houle & C Pélabon

9:00 Plenary lecture 1: Prof. T. F. Hansen CEES, Department of Biosciences, UiO, Norway

10:15 Break

10:30 Plenary lecture 2: Prof. R. De Vet VU University Medical Center Amsterdam, The Netherlands

11:45 Plenary lecture 3: Prof D. Schneider Memorial University, Newfoundland, Canada

14:00 – 17:00 Working session 1: Presentations of the measurement issues in Genomic Molecular Biology / medicine / general Ecology (Chair: To be defined)

#### **Thursday 8**

9:00 – 12:00 Working session 2

Presentations of the measurement issues in Community Ecology / Behavior / Evolution (Chair: To be defined)

12:00 - 13:00 Lunch

13:00 – 16:00 General discussion

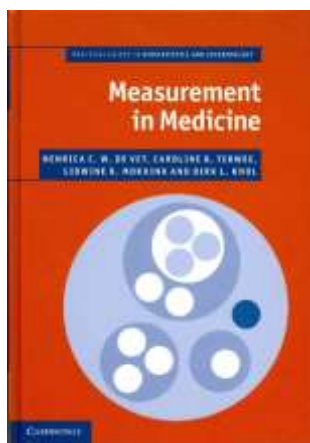
#### **Friday 9**

9:00 – 13:00 General discussion

12:00 - 13:00 Lunch

13:00 – 15:00 Discussion / conclusion

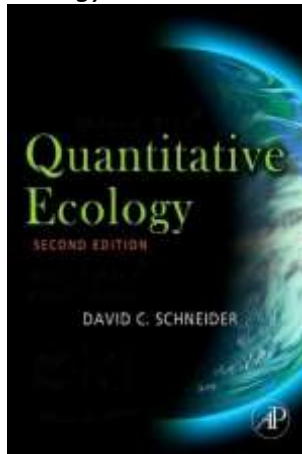
**Henrica C.W. de Vet** studied Human Nutrition at the Agricultural University in Wageningen, the Netherlands and specialized in epidemiology. In 1999 she was appointed as coordinator of the research program “Musculoskeletal Disorders” of the EMGO Institute of VU University Medical Center where she continued her work on the effectiveness of treatments for musculoskeletal disorders. She broadened her scope to the diagnostic and prognostic field and increasingly focused on the quality of outcome measurements, resulting in a professorship in clinimetrics. The main focus with regard to clinimetric issues is on the evaluation of existing measurement instruments with regard to reliability, responsiveness and assessment of minimal important changes. In 2011 she coauthored a book “measurement in medicine” and she published number of highly cited educational papers in the international literature.



<http://www.emgo.nl/team/240/riekiedevet/personal-information/>

**David Schneider** is an ecologist working at the Ocean Sciences Centre, Memorial University in Newfoundland, Canada. He has a PhD from Stony Brook University. His current research focus is on the problem of scaling up from surveys and experiments (necessarily at small

scales} to questions of regional or global importance. He has been editor of *Marine Ecology Progress Series* and *Journal of Marine Systems*. He has published many articles in highly ranked journal in ecology and Marine science and has written a book untitled “*Quantitative Ecology: Measurement, Models and Scaling*”.



<http://www.mun.ca/osc/dschneider/bio.php>

**Thomas F. Hansen** is a theoretical biologist specialized in evolutionary biology. He has had a leading role in the development of the evolvability concept in quantitative genetics but also in the development of new comparative methods. Together with Gunter P. Wagner, he also developed new statistical methods to study epistasis. He has published a large number of papers in highly ranked journals in Evolutionary Biology as well as many book chapters.

<https://www.mn.uio.no/cees/english/people/core/thomasha/>

#### List of invited

De Vet Riekie	VU University Medical Center Amsterdam, The Netherlands
Dingemanse Niels	Max Planck Institute for Ornithology, Seewiesen, Germany
Garnier, Eric	CNRS, UMR 5175, Montpellier, France
Hansen Thomas F	CEES, Department of Biosciences, UiO, Norway
Houle David	FSU, Tallahassee, USA
McIntyre Lauren	University of Florida, Dept. of Molecular Genetics & Microbiology, Gainesville, FL. USA
Mitteröcker Philipp	Department of Theoretical Biology, University of Vienna, Austria.
Morrissey Michael	School of Biology, St Andrews, UK
O'Hara Bob	CBD, Department of Mathematic, NTNU, Norway
Omholt Stig	Biotechnology NTNU, Norway

Pelabon Christophe	CBD, department of Biology NTNU, Norway
Schneider David	Memorial University, Newfoundland, Canada
Vieland Veronica	The Research Institute at Nationwide Children's Hospital & The Ohio State University, USA
Wagner Gunter P	Department of Ecology and Evolutionary Biology, Yale University, CT, USA
Yoccoz Nigel G.	UiT, the Arctic university of Norway

### **If you want to read more about measurements**

1. Hand, D.J. 2004. *Measurement Theory and Practice: The World Through Quantification*. London: Arnold.
2. Houle, D., C. Pelabon, G.P. Wagner, and T.F. Hansen, 2011. Measurement and meaning in biology. *Quarterly Review of Biology*. 86:3-34.
3. Hansen, T.F., D. Houle, and C. Pelabon, 2011. Heritability is not evolvability. *Evol. Biol.* 38: 258-277
4. Armbruster, W.S., G.H. Bolstad, T.F. Hansen, B. Keller, E. Conti, and C. Pélabon. 2017 Measurement and Mismeasurement of Reciprocity in Heterostylous Flowers. *New Phytologist* (*in press*)
5. Schneider, D.C. 2009. *Quantitative ecology: measurement, models and scaling*. 2nd ed: Academic press.
6. Huttegger, S.M. and P. Mitteroecker, 2011. Invariance and Meaningfulness in Phenotype spaces. *Evolutionary Biology*. 38:335-351.
7. Wolman, A.G., 2006. Measurement and meaningfulness in conservation science. *Conservation Biology*. 20:1626-1634.

