# Risk Assessment and Values in Science

Alexander Christian & Giovanna Cultrera & Christian J. Feldbacher & Wolfgang Kneifel & Gerhard Schurz & Charlotte Werndl

## Workshop Details

Venue: University of Salzburg
Faculty of Catholic Theology
Room: HS101
Date: September 2, 2015, 09:00–18:30

## Workshop Aims & Scope

It is an important task of science to provide means and information for applying decision making procedures to everyday life. A controversially discussed sub-task within this area consists in providing value judgements that allow one, e.g., to figure out maximal expected utilities or an adequate way of drawing qualitative conclusions from statistical tests for such decisions. This debate about the permissiveness of or even a duty for value judgements in science has lasted for more than a century now and is, due to recently rekindled proposals for the value-ladenness of science, still unsettled. The main aims of this workshop are ...

(i) ... to provide a historical and systematic overview of the value-neutrality and value-ladenness problem,

(ii) to relate the results to concrete constraints of risk assessment, and

(iii) to apply the latter results to intensively discussed decisions under risk in areas of public interest as, e.g., climate-, food- and geosciences as well as medicine.

## Funding

This workshop is supported by the German Society for Philosophy of Science (GWP) and the Duesseldorf Center for Logic and Philosophy of Science (DCLPS).

## Schedule

Wednesday, September 2, 2015:

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| 09:00 | Opening |
| 09:00–09:30 | Christian J. Feldbacher: *A Historical and Systematic Overview of the Debate about Values in Science* |
| 09:30–10:30 | Gerhard Schurz: *Error Probabilties, Rational Acceptance and the Role of Values* |
| 10:30–10:45 | Coffee Break |
| 10:45–11:45 | Giovanna Cultrera: *Science in a Criminal Trial: The L'Aquila Case* |
| 11:45–12:45 | Alexander Christian: *The Suppression of Medical Evidence* |
| 12:45–14:00 | Lunch Break |
| 14:00–15:30 | SOPhiA 2015: Plenary Lecture |
| 15:30–16:00 | Coffee Break |
| 16:00–17:00 | Charlotte Werndl: *Model Selection Theory Applied to Climate Science: the Need for a More Nuanced View on Use-Novelty* |
| 17:00–18:00 | Wolfgang Kneifel: *Food Safety Risks: Is there a Balance Between Facts and Perception?* |
| 18:00–18:30 | Closing: Final Discussion |
| 18:30 | Dinner (warm evening buffet) |

# Abstracts

### Alexander Christian: The Suppression of Medical Evidence

One of the most serious concerns about financial conflicts of interest in medical research is that they are likely to result in the suppression of evidence that is at odds with commercial interests of financiers, i.e. pharmaceutical companies. Suppression of medical evidence in terms of „active process[es] to prevent data from being created, made available, or given suitable recognition“ (Martin, 1999, 334) runs contrary to principles of good scientific practice like honesty, openness or respect for the law (Shamoo & Resnik, 2015). It can result in ignorance, misrepresentation of scientific evidence (biased scientific evidence) and a suspension of scientific self-correction. Since it is widely assumed that clinical trial registries (CTRs) provide an effective means to prevent data suppression (Dickersin & Rennie, 2003), it is important to find out whether and how CTRs can be outwitted by pharmaceutical companies.

Section 1 of this paper illustrates the problems with data suppression by pointing to the ongoing controversy about the antiviral medication Tamiflu®. Section 2 is concerned with conflicts between data suppression and principles of good scientific practice. Section 3 then provides a detailed overview of questionable research practices that might play a role in the suppression of medical evidence in clinical trials and scientific publishing. In particular, this section adresses the key question of this article, which is whether and how clinical trial registries can be outwitted by pharmaceutical companies. Against this background I am going to discuss the adverse effect that data suppression and ignorance about medical findings have on risk assessment. Finally, in section 4, I describe several responses from the scientific community and discuss additional measures that might prevent data suppression and foster research integrity and professional accountability.

### Giovanna Cultrera: Science in a Criminal Trial: The L'Aquila Case

On April 6, 2009 a magnitude 6.3 earthquake devastated the city of L'Aquila (Italy) and its surroundings, causing 309 victims. Two years later, seven experts were convicted to 6 years in jail, perpetual interdiction from public office and a fine of several million euros to be paid to the victims for having caused, by their negligent conduct, the death of 29 persons and the injury of several others.

The "seven" were convened as experts of the *Commissione Nazionale dei Grandi Rischi* (CGR, High Risk National Commission) six days before the mainshock (March 31, 2009) and, according to the verdict's motivations, they were considered guilty of manslaughter for "having conducted the prediction, the prevention and the seismic risk evaluation in a too general and approximate manner" and "for having issued incomplete, imprecise and contradictory information on the nature, causes, dangers and future developments of the seismic activity in the area in question"; "the CGR-meeting resulted in a reassuring message" that would have induced people not to leave their houses, as they were used to do by family tradition, after some shocks before the mainshock. On November 10, 2014, the appeal court demonstrated that it was all about mismanagement of a public order problem, and acquitted six of the seven formerly sentenced experts because the crime does not exist. The seventh, the vice-head of the Civil Protection, was convicted to two years in prison for 13 of the victims because he reported wrong scientific statements and violated the duty of precision and care which should inspire the risk management.

The two verdicts motivations involve difficult juridical aspects and arguments connected to the role of scientists and risk communication, all issues exceeding the local (Italian) dimension and attracting broad interest worldwide. Within the natural risks, the seismic one is characterized by a large epistemic and aleatoric uncertainty related to the expected earthquake shaking (seismic hazard), associated to the buildings vulnerability and the exposure assessment of the hazard zones. For regulatory purposes as well as in the everyday life, that hazard is described by longterm probability maps of shaking occurrence, being the scientific knowledge not enough progressed to forecast time, location and energy of an impending earthquake with the accuracy necessary for civil protection purposes. This is the reason why, during the occur-

rence of a small-to-moderate seismicity, scientists cannot give different advices than the ones discussed in the CGR-meeting. However, scientific data and results were largely debated and misused in the first verdict to demonstrate that they should have been considered to correctly estimate the risk indicators (Cocco et al., 2015).

Several reasons led to the L'Aquila trial, none of them related to science: mismanagement of the post-earthquake emergency, unprepared public authorities, society not enough educated about seismic risk and natural risks in general, together with lack of strategies to communicate lowprobability and high-uncertainties phenomena. On the other end, institutional response of research Institutes to the issues raised by the trial and to the legal liability of scientists has been softened in order to keep the conflict among institutions in a low key.

In this frame, the necessity to find a disaster's explanation out of the system, represented by the local political and social community, turned the meeting of experts into a scapegoat, diverting the attention from the real issues concerning the mitigation of seismic risk, such as the responsibility of the builders and the proper land management.

For further details, see http://processoaquila.wordpress.com/ (INGV working group for the information management on the L'Aquila trial).

*References*:

Cocco M., G. Cultrera, A. Amato, T. Braun, A. Cerase, L. Margheriti, A. Bonaccorso, M. Demartin, P. De Martini, F. Galadini, C. Meletti, C. Nostro, F. Pacor, D. Pantosti, S. Pondrelli, F. Quareni, M. Todesco (2015). *The L'Aquila trial.* In: Peppoloni, S. & Di Capua, G. (eds) *Geoethics: The Role and Responsibility of Geoscientists.* Geological Society, London, Special Publications, 419, 2015.

### Christian J. Feldbacher: A Historical and Systematic Overview of the Debate about Values in Science

The debate about the permissiveness of value judgements in science lasts now more than one century. It can be divided into three phases (cf. Schurz & Carrier 2013): The first phase in which Max Weber formulated the so-called "value-neutrality postulate". According to this postulate value judgements should be avoided in science or should be at least clearly marked as such judgements. The second phase which coincides with the so-called "Positivismusstreit" in German sociology. In this phase proponents of critical theory as, e.g., Juergen Habermas argued against critical rationalists as, e.g., Karl Popper with the help of emancipatory reasons in favour of the value-ladenness of science. And finally the third phase which took place mainly in English speaking countries and in which new theoretical arguments in favour of the value-ladenness thesis were put forward.

In this contribution a historical and systematic sketch of the debate about values in science will be given. Then the main arguments of the third phase will be explicated and applied to the so-called "L'Aquila 2009" case where earthquake experts were sentenced for their faults in generating and communicating predictions about an earthquake in this region.

**Wolfgang Kneifel: Food Safety Risks: Is there a Balance Between Facts and Perception?**

Today´s welfare society is characterized by prosperity, increased life expectancy as well as by comprehensive social and health protection. However, in terms of food quality and safety the public is increasingly scared about anxiety and false risk perception. Several factors, such as the apparently growing number of outbreaks of food- and feed borne diseases, local incidents, mass production, criminal fraud, but also changing trends in nutrition and consumer food habits, have stimulated both the public awareness and the consumers´concerns about food. Against this background as well as regional as well as global developments, food safety has become a topic of high complexity and diversity. Somehow, this observation seems to be in contrast to the explicit trend that in so-called industrialized countries consumers, on average and compared to earlier times, spend steadily decreasing proportions of their regular budget for food. So, the value of food seems to be underestimated. Due to the regulatory basis, and quite often for the sake of advertising, the consumer of today is said to be an ´informed consumer´. Notwithstanding, this so-called informed consumer is not necessarily an educated consumer, as he or she often lacks sound information and specific knowledge about food. Hence, food safety experts (either from food industry or from inter/national authorities) play some important role, as they not only contribute to ensure the quality and safety of food but also act in the dissemination of knowledge about food. Importantly, several internationally linked control measures as well as surveillance and alert networks have been established based on food law and official regulations and aim at protecting national markets from (potentially) contaminated, mislabelled or unhealthy food. In this context, there are several interfaces that still need to be further cross-linked and harmonized. In this presentation, the diversity of relevant criteria around food safety will be illuminated from different perspectives. Special emphasis will be placed on current trends and statistics, on case scenarios and related crucial questions, on the gaps and needs of public health systems as well as on risk assessment and communication related to food.

**Gerhard Schurz: Error Probabilties, Rational Acceptance and the Role of Values**

According to the so-called Lockean acceptance rule, it is rational to accept a hypothesis $H$ relative to a given rational belief function $P$ and a body of total evidence $E$, iff $H$'s probability given $E$ exceeds a contextually determined threshold $\alpha > 0.5$. Behind this innocent looking rule two philosophical problems are lurking: (a) the problem of determining the right threshold, and (b) the problem of closure under conjunctions.

In this talk I will assume a practical context, in which "to accept a proposition $H$" means that one will rely on the assumption of $H$ in practical actions. I investigate the consequences of this assumption concerning the problem of passing statistical expert information to society in the form of action recommendations (including a discussion of the L'Aquila case).

**Charlotte Werndl: Model Selection Theory Applied to Climate Science: the Need for a More Nuanced View on Use-Novelty**

Climate policy needs to be informed by the results of the best climate models, with respect to the issue at hand. To evaluate climate models, it is essential that the best available methods for confirmation are used. A hotly debated issue on confirmation in climate science (as well as in philosophy) is the requirement of use-novelty (i.e. that data can only confirm models if they have not already been used before, e.g. for calibrating parameters). This paper investigates the issue of use-novelty in the context of the mathematical methods provided by model selection theory. We will show that the picture model selection theory presents us with about use-novelty is more subtle and nuanced than the commonly endorsed positions by climate scientists and philosophers. More specifically, we will argue that there are two main cases in model selection theory. On the one hand, there are the methods such as cross-validation where the data are required to be use-novel. On the other hand, there are the methods such as Bayesian confirmation or the Akaike Information Criterion (AIC) for which the data cannot be use-novel. Still, for some of these methods (like AIC) certain intuitions behind the use-novelty approach are preserved: there is a penalty term in the expression for the degree of confirmation by the data because the data have already been used for calibration. The common positions argued for in climate science and philosophy are either that data should always be use-novel or that the use-novelty criterion is irrelevant. According to model selection theory these positions are too simple: whether or not data should be use-novel depends on the specific method used. For certain methods data should be use-novel, but for others they cannot and thus need not be use-novel.

## Speakers

**Alexander Christian** (University of Duesseldorf, DCLPS, Germany)
Alexander Christian M.A. studied philosophy, sociology and biology at the Heinrich-Heine-University in Düsseldorf, where he now is a research fellow at the Chair of Theoretical Philosophy and the Duesseldorf Center for Logic and Philosophy of Science (DCLPS). His research includes questions in the intersection between philosophy of science and ethics of science, in particular scientific misconduct & questionable research practices in medical research, the problem of demarcation and values in science.
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**Giovanna Cultrera** (Istituto Nazionale di Geofisica e Vulcanologia, Roma, Italy)
Giovanna Cultrera is researcher at the Istituto Nazionale di Geofisica e Vulcanologia (INGV, Italy), Section Seismology and Tectonophysics, and she is adjunct professor at the Department of Geological Sciences, Roma Tre University of Rome.
Her research is focused on the study of ground motion variations at the earth surface through the analysis of moderate and strong earthquakes recordings. These studies are finalized to loss and damage estimations in urban areas and infrastructures, and they have been addressed within several projects and in cooperation with international research institutions. She also works in the rapid response to seismic emergency in epicentral area, to improve the monitoring and to collect data for scientific studies, and in the INGV initiatives for seismic hazard's outreach.
Since 2012, she participates in the INGV working group for the information management on the criminal trial followed the 2009 L'Aquila earthquake, both at national and international level.
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**Christian J. Feldbacher** (University of Duesseldorf, DCLPS, Germany)
Research Fellow and DOC-scholar (Austrian Academy of Sciences) at the Duesseldorf Center for Logic and Philosophy of Science (DCLPS) at the University of Duesseldorf. Before coming to Duesseldorf, he was a visiting fellow at the Munich Center for Mathematical Philosophy (MCMP) and project staff at the University of Innsbruck. Christian's area of research focuses on general philosophy of science (analogical reasoning and concept formation, and the problem of induction) and social epistemology (tesimony, judgement aggregation).
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**Wolfgang Kneifel** (BOKU – University of Natural Resources and Life Sciences, Vienna, Austria)
Wolfgang Kneifel is head of the Department of Food Science and Technology at the BOKU and Leader of the Food Safety and Quality Assurance Laboratory, the University of Natural Resources and Life Sciences Vienna. He is Director of the Christian Doppler Research Laboratory for Innovative Bran Biorefinery. He is an expert in food microbiology, hygiene, functional foods, product development, food quality assurance, quality management and food safety. He is President of the Austrian Association of Food and Biotechnologists, and an active member in about 15 professional societies.
His research interests are on: food safety, food hygiene, food and feed product development, optimisation and quality assurance of foods, quality management, biorefinery concepts and food side product valorisation, pro- and prebiotic research, microbiological quality factors of food and pharmaceutical products, food-GI tract interactions, validation of microbiological analytic methods, development and standardisation of improved analytical tools.
He holds several international projects and cooperations with industry. Furthermore, he is in the board of more than 7 scientific journals.
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**Gerhard Schurz** (University of Duesseldorf, DCLPS, Germany)
Gerhard Schurz is Professor of Theoretical Philosophy at the University of Duesseldorf and Director of the Duesseldorf Center for Logic and Philosophy of Science. He is a member of the steering committee of the European Philosophy of Science Association (EPSA) and currently leader of several DFG-funded projects on *causality* and *induction*. Before coming to Duesseldorf, he held a chair at the University of Erfurt and was visiting professor at Yale University. His areas of research include amongst others philosophy of science (general; natural science; history of science; explanation and understanding; lawlikeness; induction and abduction; theory confirmation and verisimilitude; normic laws, structural realism), and logic (logic and relevance, probability logic, nonmonotonic logic). He is member of the editorial board of several renowned philosophy journals (amongst others Episteme, Erkenntnis, GPS, Synthese), editor of about 20 collections, and author of more than 6 books (e.g. *Philosophy of Science. A Unified Approach*, 2013)
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**Charlotte Werndl** (University of Salzburg, Austria & London School of Economics, UK)
Charlotte Werndl holds a Chair in Logic and Philosophy of Science at the Department of Philosophy at the University of Salzburg and a Visiting Professorship at the Department of Philosophy, Logic and Scientific Method at the London School of Economics. She is also an associate editor of the European Journal for the Philosophy of Science and an editor of the Review of Symbolic Logic.
Before coming to Salzburg, she was an Associate Professor at the Department of Philosophy, Logic and Scientific Method at the London School of Economics. Before joining LSE, she was a Junior Research Fellow in Philosophy at The Queen's College, University of Oxford. Her doctoral degree is from the University of Cambridge.
Her areas of specialization is in general philosophy of science, philosophy of physics, philosophy of climate science, evidence and philosophy of statistics, philosophy of mathematics.
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