An Historical and Systematic Sketch of the Debate about Values in Science

With a Case Study of the L'Aquila 2009 Trial

Christian J. Feldbacher-Escamilla

Autumn 2015

Project Information

Publication(s):

- Feldbacher-Escamilla, Christian J. (2019). "A Rational Reconstruction of the L'Aquila Case. How non-denial turns into acceptance". In: *Social Epistemology* 33.6, pp. 503–513. DOI: 10.1080/02691728.2019.1672825.

Talk(s):

- Feldbacher-Escamilla, Christian J. (2015a-09-02/2015-09-04). *An Historical and Systematic Overview of the Debate about Values in Science*. Conference. Presentation (contributed). Workshop: Risk Assessment and Values in Science. University of Salzburg: DCLPS.
- Feldbacher-Escamilla, Christian J. (2015c-06-10/2015-06-13). *Values in Science. A Case Study of the L'Aquila 2009 Trial*. Conference. Presentation (contributed). Objectivity in Science. Tilburg University: TiLPS: Tilburg Center for Logic and Philosophy of Science.
- Feldbacher-Escamilla, Christian J. (2014a-12-04/2014-12-05). *Werturteile in der Wissenschaft: Wissenschaftstheoretische und -ethische Bewertung des Falles L'Aquila 2009 (Values in Science: Evaluation of the L'Aquila 2009 case from philosophy of science's and science ethic's point of view)*. Conference. Presentation (contributed). PhD-Symposium of the Austrian Society for Philosophy (ÖGP). University of Innsbruck: ÖGP.
- Feldbacher-Escamilla, Christian J. (2014b-11-13/2014-11-14). *Werturteile in der Wissenschaft: Wissenschaftstheoretische und -ethische Bewertung des Falles L'Aquila 2009 (Values in Science: Evaluation of the L'Aquila 2009 case from philosophy of science's and science ethic's point of view)*. Conference. Presentation (contributed). Tagung für Praktische Philosophie. University of Salzburg: International Research Center Salzburg (IFZ).

Project Information

Workshop(s):

- Feldbacher-Escamilla, Christian J. (2015b-09-02/2015-09-02). *Risk Assessment and Values in Science (funded by the GWP)*. Workshop. Organization. Facts: est. 20 participants; 6 invited: Alexander Christian, Giovanna Cultrera, Christian J. Feldbacher, Wolfgang Kneifel, Gerhard Schurz, and Charlotte Werndl. University of Salzburg: DCLPS. URL: `http://dclps.phil.hhu.de/risk/`.

Course(s):

- Christian, Alexander and Feldbacher-Escamilla, Christian J. (2014-04-01/2014-09-30). *Values in Science (Werte in den Wissenschaften)*. Seminar. Teaching (class). Summer term 2014. (Introductory). University of Düsseldorf.

Introduction

Starting problem, e.g.:

- Scientific study: Authoritarian education correlates with strange behaviour.
- Scientific(?) recommendation: Children shouldn't be educated in an authoritarian way.

The problem is also relevant with respect to project funding, teaching etc.

More generally: Should science be free of values?

And what conclusions may one draw for the case of the *L'Aquila 2009* Trial?

Contents

Historical Digest & Explication

Historical Overview

First value-ladenness debate: 1909-1913 (Max Weber)

Second value-ladenness debate – Positivism dispute with two phases: 1960s & 1970s (Jürgen Habermas)

Third value-ladenness debate: mainly in anglophone philosophy since the 1950s (Carl G. Hempel)

First Debate: Historical Context

Key facts:

- 1909 – 1913: Academic discussion
- Weber vs. Schmoller: A campaign of Weber, Werner Sombart and Ferdinand Tönnies against Gustav Schmoller et al. (cf. Dahms 2013, pp.75ff)
- Weber:
  "[Values in science and teaching are acceptable only, if . . .] the teacher obliges herself the strong duty to make it clear to herself as well as to her audience which of her claims are justified by purely logical or empirical inference and which of them are value statements." (cf. Weber 2013, p.34)

First Debate: Main Theses

Ad key facts:

- Main thesis of Weber:
  1. (In teaching) value judgements are only acceptable if they are explicitly marked as such.
  2. Generally scientists should restrict themselves to means-ends claims about values.
- Main argument of Weber: Distinction is hard; suggestion of value judgements as judgements about matters of fact
- Main thesis of Schmoller: Negation of the thesis above
- Main argument of Schmoller: It is an important aim of university teaching to educate people politically, ethically, artistically, culturally etc.

Explication of Weber's Position

Our Explicandum:
'Scientific research (and teaching) should be free of value judgements.'

To clarify:

- 'Scientific research'
- 'Value judgement'

Ad 'scientific research' (cf. Schurz 2013b, pp.312f):

- context of discovery
- context of justification
- context of utilization

Explicat: scientific research = context of justification

Ad 'value judgement' (cf. Schurz 2013b, pp.310f):

- Science internal value judgements (theories should be true, informative)
- Science external value judgements (theories should be applicable etc.)

Explication of Weber's position

Also (cf. Schurz 2013b, pp.308f):

- Hypothetical value judgements (non-normative means-ends principles)
- Categorical value judgements

Explicat: value judgements = science external categorical value judgements

Whole explicat:
'Scientific theories' context of justification should be free of science external categorical value judgements.'

Second Debate: Historical Context

Key facts:

- 1960s: Positivism dispute
- 1961: *Conference of the German Society for Sociology* in Tübingen
- Popper vs. Adorno: Contributors on the methodology of the social sciences
- Of little relevance with respect to the value-neutrality postulate of Weber
- More relevance of the subsequent discussion: Albert vs. Habermas

Second Debate: Habermas

Today's understanding of 'science' is, according to Habermas, one-sided. There is a ...

> *"demarcation between knowledge and interests. At the logical stage this corresponds to the distinction between descriptive and normative statements." (cf. Habermas 2013, pp.59f)*

Habermas argues for the value-ladenness of science; in a nutshell:

1. Empirical knowledge is measured by correspondence with observational statements.
2. The acceptance and choice of observational statements depends on technical cognitive interests (especially in the choice of the framework: operationalizations etc.)
3. Therefore empirical knowledge is also influenced by technical cognitive interests.

A more concrete argumentation is provided, e.g., in (Dupré 2007).

Explication: "Thick & Thin Concepts": Dupré (Discussion)

Dupré argues against the point of view that definitions and operationalizations of relevant theoretical terms ('Sam scored 84 on the Smith-Jones physical assertiveness scale.') can be based on descriptive knowledge alone:

Contrary to this, he thinks that operationalizations of expressions like 'violence', 'rape' (evolutionary description of "weak males"), 'optimality' (in the sense of pareto-optimal efficiency) that are only fact-based are inadequate.

Possible interpretation:

- $Rape(x, y, z)$ iff $R_1(x, y, z)$ & $R_2(x, y, z)$ & ...
- $Rape(x, y, z)$ iff $R_1(x, y, z)$ & $R_2(x, y, z)$ & ... & $\mathcal{F}R_{1,\ldots,n}(x, y, z)$

(The second operationalization provides a stronger criterion.)

Third Debate: Historical Context & Inductive Risk

Carl G. Hempel, Richard Rudner, Heather Douglas, Helen E. Longino, Noretta Koertge et al.

Central topic: Indictive risk and underdetermination.

As Hempel pointed out, there are four cases to be considered in hypothesis acceptance/refutation (cf. Hempel 1965):

1. A true hypothesis is accepted
2. A false hypothesis is rejected
3. A false hypothesis is accepted
4. A true hypothesis is rejected

Inductive risk: 3,4

Third Debate: Hempel

Decision making under inductive risk:

> *"In mathematical decision theory, several criteria of optimal choice have been proposed. In case the probabilities for the different outcomes of each action are given, one standard criterion qualifies a choice as optimal if the probabilistically expectable utility of its outcome is at least as great as that of any alternative choice." (cf. Hempel 1965)*

If there is no probabilitstic information, then one has to choose other rules for decision making (Maximax, Maximin etc.).

Generally speaking there are two areas where value judgements play an important role w.r.t. the acceptance/refutation of theories' hypotheses (cf. Hempel 1965):

- In providing utilities for calculating the maximum expected utility, and:
- In choosing one of the several available decision making rules

Third Debate: Longino (Discussion)

Along a similar line is Longino's argument of underdetermination of theories by evidence in favour of value-ladenness.

One may try to solve the underdetermination problem by considering theoretical, cognitive, and superempirical values (cf. Longino 2008).

Critique by Longino: Those values are also external (they are not truth-conducive etc.). Furthermore they introduce bias (selective samples etc.; (cf. Longino 2008)).

Third Debate: Longino (Discussion)

For emancipatory reasons Longino argues for (cf. Longino 2008):

- Novelty vs. Orthodoxy, i.e. consistency with available theories
- Heterogenous Ontology vs. Reductionism and Simplicity
- Reciprocity and Complexity vs. Monocausality

Problem: Why not also consider religious virtues and values?

Furthermore, some of the "superepistemic" values can be reduced to epistemic ones.

Main Argument Against Value-Neutrality

Third Debate: Rudner

Rudner's main argument (cf. Rudner 1953):

1. Hypothesis evaluation presupposes a choice of confidence intervals.
2. The choice of such intervals presupposes values.
3. Hypothesis evaluation is at the core of science's context of justification.
4. Hence: Science presupposes value judgements.

Critique:

- Scientists could in principle restrict themselves to, e.g., statements about the degree of confirmation: $Pr(H|E) = r$ (cf., e.g., Jeffrey 1956)
- Scientists can work with confidence intervals without sticking to them categorically (outsourcing of value judgements): $Pr(H|E) = r$ and provided a threshold of $r \geq 0.95$ one may Acc_H
- One can also try to reduce the problem to a purely epistemical one: $Pr(H|E) = r$ and epistemically optimal is a threshold $r \geq n$, hence Acc_H is rational iff $r \geq n$.

Third Debate: Example

Example for calculating an acceptable inductive risk:

- We suppose that there are two alternatives: Accepting H or refuting it by accepting $\sim H$.
- The expected utilities are as follows:
  - $ExpUtil(H) = Pr(H) \cdot u(Acc_H|H) - Pr(\sim H) \cdot u(Acc_H| \sim H)$
  - $ExpUtil(\sim H) = Pr(\sim H) \cdot u(Ref_H| \sim H) - Pr(H) \cdot u(Ref_H|H)$
- For a rational choice of H vs. $\sim H$ we need: $ExpUtil(H) > ExpUtil(\sim H)$.
- Therefore, for a rational choice of H vs. $\sim H$ it holds:

$$Pr(H) > \frac{u(Acc_H| \sim H) + u(Ref_H| \sim H)}{u(Acc_H|H) + u(Acc_H| \sim H) + u(Ref_H| \sim H) + u(Ref_H|H)}$$

Third Debate: Example

Example: Risk assessment with respect to mitigation of hazards (e.g.: evacuation for mitigation of WWII bomb in Koblenz, December 4, 2011 – casualities expressed in compensatoric loan differential: est. $1.5 MioEUR/person$):

- H: Mitigation succeeds.
- $u(Acc_H|H)$: Utility/costs for accepting H given H – no extra costs $0 EUR$
- $u(Acc_H|\sim H)$: Utility/costs for accepting H given H is wrong – failed mitigation without evacuation $450 MioEUR$
- $u(Ref_H|\sim H)$: Utility/costs for rejecting H given H is wrong – failed mitigation with evacuation $1.2 MioEUR$
- $u(Ref_H|H)$: Utility/costs for rejecting H given H – unnecessary evacuation $1.2 MioEUR$

Therefore, for Acc_H we need: $Pr(H) > 0.9973$.

Upshot

To sum up, the explicated value neutrality postulate requires that . . .

- . . . the scientist provides adequate empirical (probabilistic) information, and
- . . . if the scientist makes or presupposes value judgements, she marks them clearly as such.

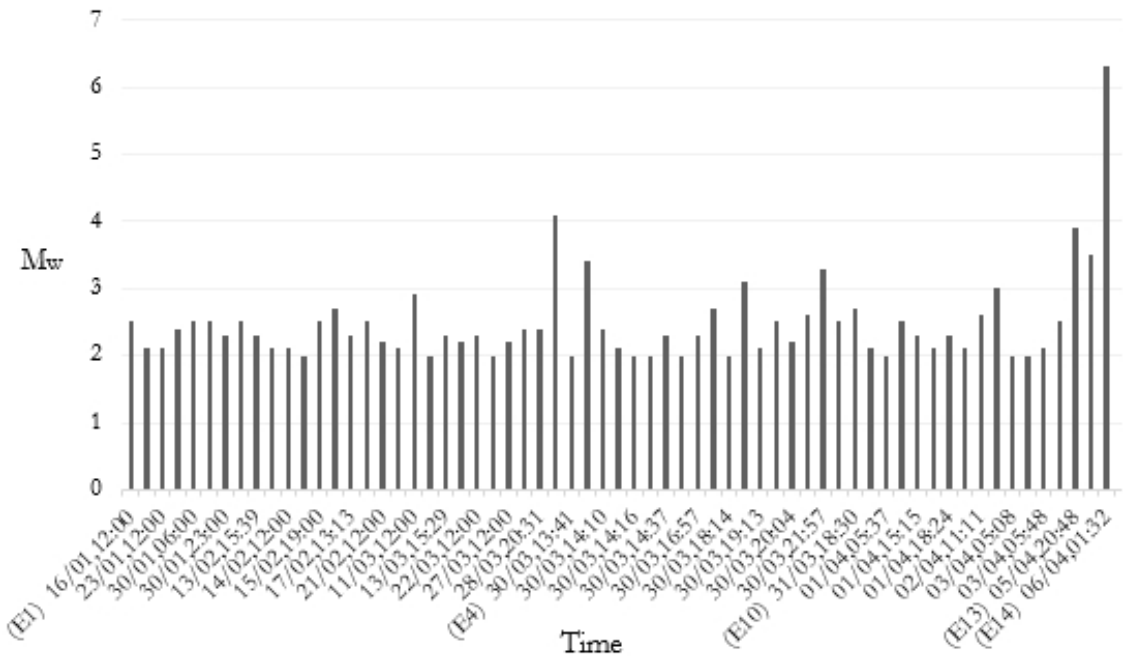
As a consequence of the latter the scientist needs to take special care in communicating her results to the public.

As we will see in the following section, the fulfillment of both constraints was heavily discussed in the case of the *L'Aquila 2009* Trial.

The L'Aquila 2009 Trial

The L'Aquila 2009 Trial

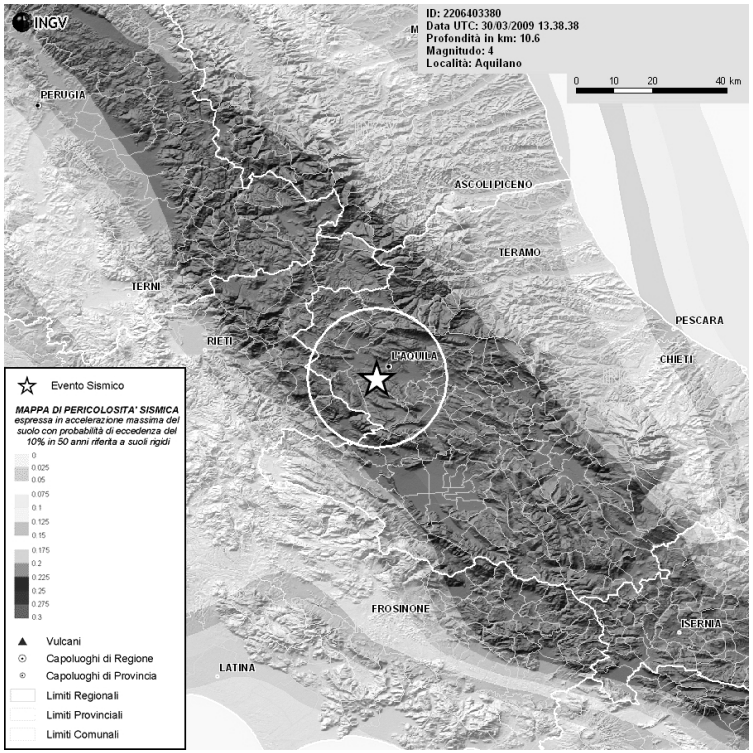
Prehistory:



The L'Aquila 2009 Trial

Facts:

- March 2009: Slight eruptions in L'Aquila
- March 31, 2009: Risk panel has a meeting to assess the risk of an earthquake $M_w \geq 5.5$: 6 scientists (geologists) and 1 official



The L'Aquila 2009 Trial

- March 31, 2009: There is no increase in earthquake risk – (almost) no communication of the scientists
- March 31, 2009: Claim of the official (Dr. Bernardo De Bernadinis): "the local citizens should go have a glass of wine".
- April 6, 2009: Earthquake of $M_w = 6.3$ hits L'Aquila. Consequence: 309 deaths
- September 2011 – October 2012: Trial against the panel
- October 2012: Conviction of the panel's members: Manslaughter and bodily harm: 6 years imprisonment (and about 9 Mio EUR compensation)
- January 2013: *Motivazione* of Judge Marco Billi

The Verdict

Facts: *Motivazione* of Judge Billi (Science AAAS 2013-01-21):

- 3 days before deadline; 950 pages
- Mainly in favour of the prosecution (plead for 4 years)
- "He explains that the trial was not against science but against seven individuals who failed to carry out their duty as laid down by the law. The scientists were not convicted for failing to predict an earthquake, something Billi says was impossible to do, but for their complete failure to properly analyze, and to explain, the threat posed by the swarm."
- Ad inadequacy of the explanation: "the experts spoke directly with the public rather than via the civil protection department."
- "Billi ruled that this failure led to the deaths of 29 of the 309 people killed in the quake and to injuries of four others."

Two main faults:

1. Wrong analysis: $Pr(H)$ inadequatly estimated
2. Failures in communication (cf. Webers postulate regarding teaching)

Consequences

vs.

Billi on the Inadequacy of *Pr*

Billi refered to a paper by Enzo Boschi, Paolo Gasperini, and Francesco Mulargia: Long term probabilities of an earthquake with $M_w \geq 5.9$ in the region Aquilano, starting from 1995:

Zone	Last Event (m/d/yr)	Gauss Process 5yr	20yr	100yr
34	10/06/1762	1.00-1.00	1.00-1.00	1.00-1.00

Contra Billi: Only long-term predictions (hazard map) vs. short-term predictions

A More Important Hypothesis H

The more earthquakes that occur within a swarm, the lower the probability of a big quake:

$$H: \ Pr(e_{t_n} \geq 5.5 | e_{t_1} \& \ldots \& e_{t_{n-1}}) < Pr(e_{t_n} \geq 5.5 | e_{t_1} \& \ldots \& e_{t_{n-2}})$$

Such a hypothesis was used for the media movement of several officials.

It lead the locals of L'Aquila to change their usual behaviour (sleep outside during a swarm).

And according to the minutes of the panel meeting it was not explicitly rejected (only implicitly in reference to the hazard map).

This was also one of the main arguments of the prosecution in the appeal.

Revision of the Sentence: Appeal

Facts: (BBC News: November 10, 2014):

- "According to Reuters, they noted that one committee member had said there was 'no danger' from the tremors."

Facts: Neutralization of the sentence (The Guardian: November 10, 2014, John Hooper):

- "A court has upheld the appeals of six scientists and an official against their convictions for having given criminally negligent reassurances to the population"
- "But the judges endorsed a conviction and two-year sentence passed on one of the defendants, Bernardo De Bernardinis, on a connected charge."

Only one failing of a member:

1. Failures in communication

Summary

- Value-neutrality postulate: Scientific theories' context of justification should be free of science external categorical value judgements.
- Hempel/Rudner: inductive risk $\Rightarrow$ value judgements
- Contra: Only hypothetical formulation with the consequence for science:
  - Adequate estimation of the inductive risk
  - Adequate communication of it
- The L'Aquila 2009 Trial:
  - Trial: Failing in both areas
  - Appeal: Failing only in the second area – mainly by the official

References I

Boschi, Enzo, Gasperini, Paolo, and Mulargia, Francesco (1995). "Forecasting where Larger Crustal Earthquakes are Likely to Occur in Italy in the Near Future". In: *Bulletin of the Seismological Society of America* 85.5, pp. 1475–1482.

Dahms, Hans-Joachim (2013). "Bemerkungen zur Geschichte des Werturteilsstreits". In: *Werte in den Wissenschaften. Neue Ansätze zum Werturteilsstreit*. Ed. by Schurz, Gerhard and Carrier, Martin. Berlin: Suhrkamp, pp. 74–107.

Dupré, John (2007). "Fact and Value". In: *Value Free Science? Ideals and Illusions*. Ed. by Kincaid, Harold, Dupré, John, and Wylie, Alison. Oxford: Oxford University Press, pp. 27–41.

Feldbacher-Escamilla, Christian J. (2019). "A Rational Reconstruction of the L'Aquila Case. How non-denial turns into acceptance". In: *Social Epistemology* 33.6, pp. 503–513. DOI: 10.1080/02691728.2019.1672825.

Habermas, Jürgen (2013). "Erkenntnis und Interesse". In: *Werte in den Wissenschaften. Neue Ansätze zum Werturteilsstreit*. Ed. by Schurz, Gerhard and Carrier, Martin. Berlin: Suhrkamp, pp. 57–73.

Hempel, Carl G. (1965). "Science and Human Values". In: *Aspects of Scientific Explanation and Other Essays in the Philosophy of Science*. New York: Free Press, pp. 81–96.

Jeffrey, Richard C. (1956). "Valuation and Acceptance of Scientific Hypotheses". In: *Philosophy of Science* 23.3, pp. 237–246. URL: http://www.jstor.org/stable/185418.

References II

Longino, Helen E. (2008). "Values, Heuristics, and the Politics of Knowledge". In: *The Challenge of the Social and the Pressure of Practice: Science and Values Revisited*. Ed. by Carrier, Martin, Howard, Don, and Kourany, Janet A. Pittsburgh: University of Pittsburgh Press, pp. 68–87.

Rudner, Richard (1953). "The Scientist Qua Scientist Makes Value Judgments". In: *Philosophy of Science* 20.1, pp. 1–6. DOI: 10.1086/287231.

Schurz, Gerhard (2013a). *Philosophy of Science. A Unified Approach*. New York: Routledge.

— (2013b). "Wertneutralität und hypothetische Werturteile in den Wissenschaften". In: *Werte in den Wissenschaften. Neue Ansätze zum Werturteilsstreit*. Ed. by Schurz, Gerhard and Carrier, Martin. Berlin: Suhrkamp, pp. 305–335.

Schurz, Gerhard and Carrier, Martin, eds. (2013). *Werte in den Wissenschaften. Neue Ansätze zum Werturteilsstreit*. Berlin: Suhrkamp.

Weber, Max (2013). "Der Sinn der 'Wertfreiheit' der soziologischen und ökonomischen Wissenschaften". In: *Werte in den Wissenschaften. Neue Ansätze zum Werturteilsstreit*. Ed. by Schurz, Gerhard and Carrier, Martin. Berlin: Suhrkamp, pp. 33–56.