Teaching Portfolio

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This document provides an overview of the courses I have taught at the University of Bern from 2002 to 2007.

1 Introduction to the Philosophy of Causation

This Introduction to the philosophy of causation provides a systematic overview of the most influential theoretical accounts of causation, including regularity accounts, probabilistic and counterfactual analyses and transference theories. Moreover, the course introduces the main methodologies and techniques of causal reasoning.

The course is based on the following introductory script:

- BAUMGARTNER, MICHAEL and GRASSHOFF, GERD, *Kausalität und kausales Schliessen. Eine Einführung mit interaktiven Übungen*, Bern: Bern Studies 2004

The script is accompanied by a host of computer based exercises and applets by means of which students can autonomously deepen their understanding of the theories and train their practice in causal reasoning.

The topics of the weekly lectures are:

- Introduction
- The relata of the causal relation
- Causal relevance and causal graphs
- Sufficient and necessary conditions
- INUS-conditions and minimal theories
- Alternative theories of causation
- Transitivity, overdetermination, epiphenomena
- Types of causal inferences
- Homogeneity, inference algorithms
- Testing Homogeneity
- Experiment
- Complex causal structures

2 Introduction to Classical Logic

This introduction to classical logic provides the fundamentals of propositional and extended first-order logic. Apart from techniques to evaluate the validity of arguments (truth-tables, propositional and first-order calculi) the course focuses on the formalization of scientific arguments and on metalogical questions as e.g. concerning decidability. The means and limits of classical logic are thus embedded within the broader context of the reconstruction of scientific arguments.

The course is based on the following introductory script:

- LAMPERT, TIMM, *Klassische Logik. Einführung mit interaktiven Übungen*, Bern: Bern Studies 2004

The script is accompanied by a host of computer based exercises and applets by means of which students can autonomously train their practice in applying logical techniques and especially calculi.

The topics of the weekly lectures are:

- Means and ends of classical logic
- Truth-tables
- Formalization in propositional logic
- Propositional calculus
- Propositional inference rules
- Correctness and completeness
- Introduction to first-order logic
- Formal semantics
- Formalization in first-order logic
- First-order calculus
- Identity
- Undecidability

3 John Stuart Mill's *System of Logic* and his Critics

Of the 6 books that constitute Mill's *System of Logic* (1843) none has attracted as much attention as book 3 on induction. Therein Mill develops the fundamentals of his scientific methodology which is designed to reveal causal structures and laws by means of four simple rules in combination with a handful of universal principles. Predecessors of these four inference rules have been discussed by the scientific community at least since Francis Bacon. Yet, Mill simplifies and radicalizes these rules in a way that, provokes vehement opposition in parts of the community. As a result, an intense debate arises concerning questions as to the relationship between deduction and induction, the justification of inductive reasoning, the role hypotheses play for scientific theorizing and as to whether scientific reasoning can be regulated in the first place. Participants in this debate are – among others – John Herschel, W. Stanley Jevons, Francis H. Bradley and, most of all, William Whewell.

By confronting Mill with his critics we are going to pin down Mills central theses and balance his methodology against the alternatives proposed by his critics.

The topics of the weekly lectures are:

- Mill's general view on the means and ends of logic
- Induction vs. deduction – the primacy of inductive reasoning
- Jevon's criticism of Mill's primacy of induction
- Principles and rules of induction
- The Whewell-Mill debate
- The law of causality
- The four methods of experimental inference (I)
- The four methods of experimental inference (II)
- The critics of Mill's method
- (Causal) explanation
- The role of hypotheses
- Concluding discussion

4 Realism vs. Anti-Realism

Do scientific theories aim at providing true or merely empirically adequate representations of reality? Does acceptance of a scientific theory commit to belief in the existence of the entities postulated by that theory? Does scientific progress constitute a discovery or an invention? Are there theory-independent observations or is every observation theory-laden? That is the type of questions discussed by so called scientific realists (e.g. Maxwell, Smart, Putnam, Boyd, Ellis), on the one hand, and their empiricist and positivistic opponents (e.g. Reichenbach, Suppes, Carnap, Laudan), on the other. In 1980, Bas van Fraassen presented his position on these matters in his highly acclaimed book entitled *The Scientific Image* which as meanwhile become a modern classic of the philosophy of science. Van Fraassen intends his *constructive empiricism* to occupy a middle ground between scientific realism and anti-realism.

With recourse to authors as Grover Maxwell and Rudolf Carnap we are first going to clarify the conventional positions involved in the realism vs. anti-realism debate. Against his background we are then going to systematically pin down van Fraassen's constructive empiricism and locate that position in the polarity of realism and anti-realism.

The topics of the weekly lectures are:

- Introduction
- Theoretical terms as instruments for calculations
- Theoretical entities
- Empirical underdetermination of theories
- Underdetermination and the 'No-Miracle'-argument
- Scientific progress and explaining scientific success
- Argumentative stalemate
- Truth vs. empirical adequacy
- 'To save the phenomena'
- Empiricism and scientific method
- Pragmatics of explanation (I)
- Pragmatics of explanation (II)
- Structural realism
- Concluding discussion

5 Logic of Scientific Discovery

Classical scientific methodologies, as e.g. the one developed by Mill (1843), require to inductively build up scientific theories from observational data. On the first pages of his *Logic of Scientific Discovery* (1934), Karl Popper, thereagainst, proclaims: "In my view there is no induction". According to Popper, experimental data does not guide the build-up of scientific theories, but rather their falsification. After scientific theories have been generated in an uncontrollable creative process, they enter a quasi-evolutionary selection procedure, in the course of which the most truth-like theories prevail. This is the core of Popper's philosophy of science that – in the second half of the 20th century – induces an intense debate, participants of which are Neurath, Carnap, Kuhn, Lakatos, Reichenbach, Salmon, Zahar or Worrall.

In this course, we are first going to carefully study Popper's philosophy of science such that, subsequently, we can confront it with its critics.

The topics of the weekly lectures are:

- Introduction
- The problems of induction and demarcation

- Theories and falsifiability
- The problem of empirical basis and degrees of testability
- Simplicity and corroboration
- Bucket model vs. spotlight model
- Knowledge and closeness to truth
- Thomas Kuhn: Logic vs. psychology of research
- Imre Lakatos: Research programs
- Wesley Salmon: Justification of Induction
- Grover Maxwell: Non-falsifiability of theories
- E. G. Zahar: The Problem of the empirical basis
- John Worrall: Popper vs. scientific practice

6 British Empiricism

The rise of empiricism in the 17th and 18th centuries called for turning away from metaphysical speculation and for focusing on observation and experiment instead. While the empiricist conviction as to the general reducibility of human knowledge to perception is hardly propagated any longer, empiricist methodologies of scientific discovery still enjoy great popularity. In this seminar we a take detailed look at the main works of three authors which are – to a large extent – responsible for this development: John Locke, George Berkeley und David Hume. We discuss the epistemological questions they devoted their work to and study their philosophies of science.

The topics of the weekly lectures are:

- Introduction
- Starting point of empiricism – Tabula Rasa
- Origin and nature of ideas
- Knowledge
- Expansion of knowledge
- Causes and effects
- Inferring ideas from observation
- Skepticism
- The relation of language and world
- Immatrialism – *Esse Est Percipi*
- Objections against immatrialism
- Instrumentalism
- Concluding discussion

7 Determinism

Since antiquity philosophers have been reflecting on the principle of determinism. Over the centuries, however, the debate has generated virtually no mutual consent. Not even content and status of the principle are commonly agreed on. Some hold that it requires there to be a cause for every effect, according to others it stipulates the same effects to be preceded by the same causes, still others claim that the principle of determinism does not involve the notion of causation but the notion of predictability, and finally there are those that see it to be wholly contentless. Some claim that the principle is of metaphysical nature, others, thereagainst, profess that not the world, but only scientific theories can be said to be deterministic. Opinions as to the validity of the principle diverge even further. According to some, the indeterministic nature of the standard interpretation of quantum mechanics proves the invalidity of the principle, while others hold the principle the express an *a priori* truth. The most intense controversies, however, do not concern content, status or validity of the principle,

but the question as to what philosophical consequences would follow from a possible validity or invalidity of the principle. Just to mention one example: Some say that if determinism is true, free will is impossible, others, thereagainst, claim that the validity of the principle of determinism is a precondition of free will. In this course we are going to clear up these confusions and balance the different positions against each other.

The topics of the weekly lectures are:

- Introduction – Leibniz, Laplace, Du Bois-Reymond
- Metaphysical and critical determinism – Cassirer
- Is the principle of determinism vacuous? – Russell
- Is the principle of determinism vacuous? – Hempel and Kukla vs. Schlesinger and Dieks
- Uncertainty principle, wave function and determinism
- Classical mechanics vs. quantum mechanics
- EPR, Bell's theorem and determinism
- Determinism and moral responsibility I – Campbell
- Determinism and moral responsibility II – Smart and Mackie
- The consequence argument – Inwagen vs. Lewis
- Determinism and fatalism
- Concluding discussion

8 Mind-Body Interaction

There are countless different accounts to model the interaction of mind and body. Some of them, especially those that presuppose a dualistic ontology, have gone out of fashion in recent decades, others – mostly physicalistic ones – as functionalism and supervenience and emergence theories are still intensely debated. At the moment none of them is likely to prevail any time soon. Irrespective of whether one is a friend of functionalism, epiphenomenalism or prefers supervenience or emergence theories, the causal relation plays a central role in one's theorizing about mental and physical phenomena. Mostly, however, the causal relation is simply presupposed as a primitive notion. At times, this gives rise to causal models of the relationship between mental and physical processes which contradict all presently known accounts of causation. A specifically interesting example in this context is epiphenomenalism which stipulates a kind of properties or factors – the mental ones – that can only operate as effects, but not as causes, within causal structures. No presently known theory of causation leaves room for such causally impotent factors.

Thus, there is a gap to be filled in the debate over mind-body interaction. No doubt, explicitly reflecting the different notions of causation involved in these theories constitutes an additional criterion that decides among them. In this research seminar we going to take on that task. We are going to work on a modeling of the mind-body interaction that takes into account and profits as much as possible from the state of the art in the philosophy of causation.

The topics of the weekly lectures are:

- Introduction
- Introduction – Problem and historical background
- The Knowledge Argument
- Identity theory and functionalism
- Anomalous monism I
- Anomalous monism II
- Mental Causation and supervenience
- Non-reductive physicalism and the problem of exclusion

- Reductive physicalism and multiple realization
- Perspectivism
- Anti-reductionism and causal relevance of intentional states
- Freedom of will and eliminative materialism
- Concluding discussion

9 Laws of Nature

What are laws of nature? An answer to that question that prima facie suggests itself has been to define laws of nature as non-tautologous true statements expressing a uniform regularity among phenomena, i.e. as statements of the form: Whenever something is F, it is G as well. For instance, whenever the temperature of a gas is increased while its pressure stays the same, the volume of the gas increases as well. On the one hand, however, accidental regularities as "Whenever a person is president of the USA, that person is male" also report non-tautologous uniform regularities without being laws of nature. On the other hand, many statements commonly identified to be lawlike do not report uniform regularities, as e.g. statistical laws of quantum mechanics or Kepler's laws which only hold approximately. The seemingly obvious answer to the introductory question given above, thus, neither provides sufficient nor necessary conditions for lawhood.

In this seminar we will be concerned with the theoretical approaches to complement the prima facie answer in order to render it sufficient and/or necessary for lawhood. Among others, the following additional criteria for lawhood are available in the literature: Laws of nature support counterfactual conditionals, laws of nature also hold for presently unrealized phenomena, laws of nature receive inductive support, laws of nature are simple and have great explanatory power, or what laws of nature are is simply determined by well confirmed and successful scientific theories. Moreover, there are accounts that suggest not to complement the prima facie answer, but to refute it: Laws of nature are not true, they do not talk about the world, they are mere calculating devices within scientific theories.

The topics of the weekly lectures are:

- Introduction
- Regularity theories I
- Regularity theories II
- Laws of nature and counterfactual conditionals
- Laws of nature and dependencies among universals I
- Laws of nature and dependencies among universals II
- Laws of nature and scientific laws
- Laws of nature as rules of inference
- Laws of nature, systematization, supervenience
- Ceteris-paribus clauses I – laws of nature lie
- Ceteris-paribus clauses II – laws of nature hold strictly
- Science without laws
- Concluding discussion