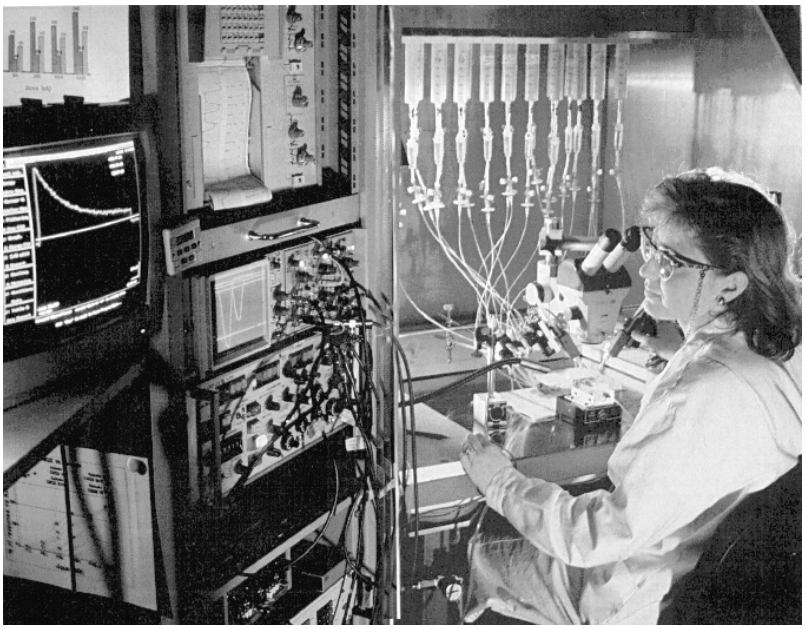
Philosophy of Science



Fall 2017

COR 1002

Contents

Há metafísica bastante em não pensar em nada.

O que penso eu do mundo?
Sei lá o que penso do mundo!
Se eu adoecesse pensaria nisso.

Que ideia tenho eu das cousas?
Que opinião tenho sobre as causas e os efeitos?
Que tenho eu meditado sobre Deus e a alma
E sobre a criação do Mundo?
Não sei. Para mim pensar nisso é fechar os olhos
E não pensar. É correr as cortinas
Da minha janela (mas ela não tem cortinas).

O mistério das cousas? Sei lá o que é mistério!
O único mistério é haver quem pense no mistério.
Quem está ao sol e fecha os olhos,
Começa a não saber o que é o sol
E a pensar muitas cousas cheias de calor.
Mas abre os olhos e vê o sol,
E já não pode pensar em nada,
Porque a luz do sol vale mais que os pensamentos
De todos os filósofos e de todos os poetas.
A luz do sol não sabe o que faz
E por isso não erra e é comum e boa.

Fernando Pessoa[1]

1. For a translation see the last page of this course manual.

General Information

Introduction

Science plays a central role in our society. The results of science - for better or worse - are all around us. Universities today are the gateways to science. Hence in any academic study a central issue must be the nature of science: What is science? This is a question that philosophy of science deals with. Hence, given the prominent position and role of science in our society, one of the core courses at UCM deals with philosophy of science[1]

In this course we will look into the nature of science and scientific method. We will address questions such as: How does scientific knowledge come about? What is the role of observation in science? What counts as a scientific explanation? How is scientific knowledge demarcated from non scientific knowledge? Do the sciences progressively yield better knowledge of the world? Why do scientists prefer one theory over another? What are typical problems of the social sciences? Can they be modeled on the natural sciences or not?

Aims of the course

At the end of the course the student should know the major problems and positions in contemporary philosophy of science. More specifically:

1. Students know some of the major approaches in the philosophy of science, such as the traditional or received view, Karl Popper's critical rationalism and its variants, Kuhn's theory of scientific revolutions.
2. Students have knowledge of the major problems or topics in the philosophy of science, such as the demarcation between science and non-science, the role of observation in science, the nature of scientific method (notably induction and falsification), the issues of realism and instrumentalism, the problem of progress in knowledge.
3. Students have knowledge of some of the major problems in the foundations of the social sciences, such as explanation vs understanding, structuralist vs individualist views on explaining human behavior, the limits of prediction in the social sciences, the role of social science in society.

Students must master the materials on these fundamental issues and positions. This part of the course aims will be prominently assessed in the test at the end of the course.

Only through mastering these materials can students sensibly attain a more general aim of this course: to learn to take up a position on these issues and perspectives and put up reasons why they come to accept something as their preference. This aspect of the course can be best exemplified in the paper that is also part of the course assessment, and of course should also be practised in the discussions during tutorials. This point as a whole needs a bit of extra explanation.

This course does not aim to provide 'the correct view' of the nature of science. All the views that have been developed over time have merits and defects. Among experts there is no consensus on what the correct answer is and none is to be expected. So, as no 'true picture' of science will emerge from the course, what must students master here?

1. At UCM there are - as you know - four core courses, and all of these address a central issue for academics: 1. What happened in the last 75 years? (Contemporary world history); 2. What is the role of politics in society? (Political philosophy); 3. What is the role of models and abstract theories in the sciences? (Modeling nature) ; 4. What is science? (Philosophy of science).

The major objective is that students develop an idea of what science amounts to, and can argue the merits of their view. When it comes to applying the views dealt with in this course, the decisive issue is whether a person can produce arguments why a particular position is considered as the best. Students must never sidestep debate on this. So, it is bad form to say things like: 'This is what I believe, you believe something different, and as it is all subjective there is no sense in talking any further about it.' It is essential to give arguments why you think a certain idea is worthwhile, or rubbish. And to be able to present such arguments students must have enough knowledge of the various problems in the field and the solutions that philosophers have proposed for them.

Assessment

In this course there will be two assessments.

1. A test at the end of the course covering all the material (the book plus the supplementary articles) and the lectures. The test will consist of essay questions. (60% of final grade)

Grading will be done on the basis of detailed answer keys. Borderline tests (between 5 and 6) will be regraded by a second teacher.

2. A paper. For the format, see below (40% of final grade)

Papers are graded on the basis of the four standard dimensions: Goal/purpose, Structure, research and Readability. For reasons explained in the next papragraph, content will be the most important aspect. Formal aspects hold a background position

Writing Assignment

Topic of the paper

The writing assignment gives students the opportunity to delve into a specific subject, problem or field and to apply their insights in philosophy of science. It is essential that students in their paper show that they can put forward arguments why they accept or reject a position. Examples of topics or problems to write about are: Induction, explanation, falsification, Popper's critical rationalism, Thomas Kuhn and paradigms, progress in scientific knowledge, realism, explanation versus understanding, values in science. In short: anything dealt with during the course may be a topic for the paper. Preferably, students will use the literature from the course (this is obviously the most efficient way to work on your paper), but they may also look for other sources to use in their paper.

Internet offers a lot of information on philosophy, and there is nothing against using this as a source. However, if you use an internet site, always put a reference to it in your paper. Be aware that leaving out such references is plagiarism. See also below on making references.

Format of the paper

The paper should be about 2000 words. As it is a rather short paper, do not make too many subdivisions and use the usual structure: 1. A beginning, stating the problem or topic, 2. A main section outlining your treatment of the topic and presenting your argument, and, finally, 3. A conclusion where you wrap up what you have done.

Whatever topic you go for, try to see to it that you include possible objections to what you argue for. This is not that difficult, as philosophy of science is characterized by plenty of disagreements, and different approaches abound.

When you use literature (or web sites), and you put a point made by another author in your

paper, always make a reference to the work from which you have taken this point. Most of what you will be doing is putting the arguments, theories or positions that you have found into a logical order in your paper. In the process you paraphrase the position of others in your own words. The latter is important: Do not just copy paragraphs from a book. Rephrase texts in your own words.

Sometimes, when an author makes a very interesting point, uses a particularly happy phrase or says something that you want to criticize/comment on in detail, you may want to quote the author. Always put quotation marks around anything that you have copied, and never copy large sections of text (i.e. more than say 4 or 6 lines) for this purpose. Always make a (foot) note, indicating where you have found the piece of text quoted. Not doing this, is a form of plagiarism. If caught out you will forfeit the course. Copying and pasting pieces of text from the internet is as much a form of plagiarism as is copying from a book!

You will have to declare a subject for your paper at the latest in the 4th week of the course. Papers are to be handed in during the last week of the course. The final deadline will be announced during the course. Failure to comply with deadlines looses you all credits on the writing assignment. You must upload a copy of your paper via Safe Assignment *and* hand in a paper copy at OSA or the pigeon hole of your tutor.

The requirments for the paper have been deliberately kept open (some could say 'vague'). Students should be free to choose a topic, and handle it as they seem fit. So, no worries about the number of external sources or other formal stuff. Explore, discover, wander around. Maybe you get lost, but that will not be held against your paper, as long as it is a sincere attempt to develop an idea or perspective in philosophy of science. the one over-arching requirement is: analyze something from a position in the philosophy of science.

Important

In order to receive a grade for the paper you must make a serious attempt at passing your paper. If the paper you hand in to your tutor is not deemed a serious attempt you will not receive a grade and you will not qualify for a resit. The same thing holds for the exam. If the exam is not deemed a serious attempt you will not receive a grade and will not qualify for a resit.

Resit

In case the final grade of the course is below 5.5, and you have fulfilled all the requirements for the course, you are eligible for a resit. The resit will be an exam that will be scheduled during the resit period.

Readings

Essential for the course is: *Alan Chalmers, What is this thing called science, 3rd edition, 1999 or later.* All students must get a copy of this book. Supporting the main text are articles on various topics in the philosophy of science. The total number of pages to be studied is about 660. An annotated (= describing the major topic of a text) list can be found at the end of this course manual. The number of pages to be studied varies from problem to problem. The reading can be as low as 25 or be up to 80. To get an idea of the work needed to cover the literature the approximate number of pages to be read is listed below each problem together with a reference to the texts to be studied. Anticipate (= Read ahead) for occasions when there is a lot of reading to do.

Perhaps this is the right moment to point out the following. Most of the literature in this course is to be read quite carefully, and it is especially necessary to follow the arguments of authors in detail. Reading these texts is not 'information gathering', but following the logic of an ar-

gument, and understanding the conclusions reached. Not everybody is used to this. You may need to read a text more than once. Some texts are listed under more than one problem. This also indicates these are worth reading more than once.

As part of the literature consists of articles or chapters from books, you may sometimes have the feeling that you lack context, or that names crop up that you have not seen before. Go to any good introduction or handbook of philosophy and look these up, if it impedes understanding of the argument. Of course you can always try and ask the members of your tutorial group.

House rules

1. Lap tops, tablets and smart phones cannot be used during tutorials. They must be off and kept off the table at all times.
2. It is mandatory to bring a hard copy of the course manual to the tutorials. With no digital access a hard copy is indispensable. OSA prints enough copies, so you should get a copy before the course starts. Coming to the tutorial without a copy of the course manual will result in being sent away to get one, and will loose you the attendance. To ensure that everybody gets a hard copy before the course starts, the course manual will be deleted from Eleum the day before the course starts. So get your print before this day.
3. There is a 5 minute grace period for being late at a tutorial meeting. If you are more than 5 minutes late you will loose the attendance for that meeting.
4. At a date to be specified during the course you will have to hand in your paper. This must be done both digitally through safe assign on Eleum, and in the form of a hard copy. If you do not hand in a hard copy your paper will not be graded.
5. The standard requirement of 85% attendance applies. This means you may miss 2 meetings if you have *good reasons* to do so. With three missed meeting there is an additional assignment. More meetings missed means failing the course.

Course coordination

Louis boon, UCM, louis.boon@maastrichtuniversity.nl
Peter Vermeer, UCM, peter.vermeer@maastrichtuniversity.nl

Schedule of lectures and tutorials

There is the standard PBL-rythm of two tutorial per week. Each week there is a lecture providing background and context. Roughly the schedule is like this:

Tutorial	**Lecture**
1. Sources of knowledge 2. Induction	Knowledge and certainty
3. Explanation 4. Trial and error	Induction
5. Kuhn and Lakatos 6. Realism	Popper
7. Progress 8. Explanation in social science	Kuhn
9. Prediction and prophecy 10. Understanding	Nature of social science
11. Social science and society	Science & society

Consult your electronic schedule for details.

Problems

1. Sources of knowledge

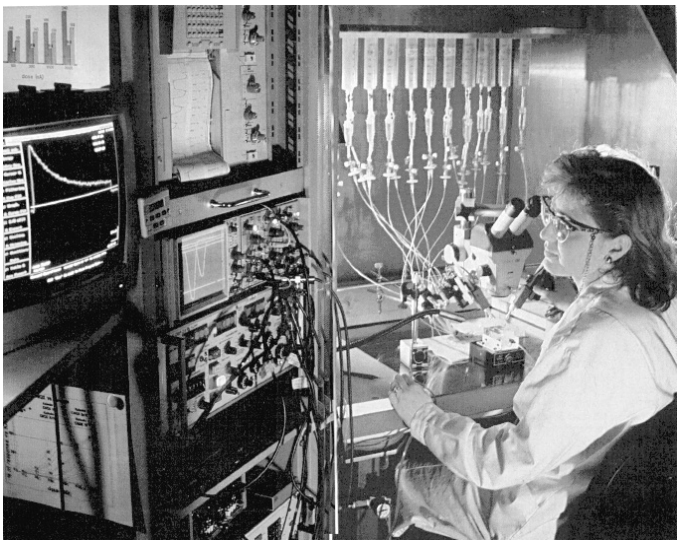
Human animals are very good at gathering knowledge, especially through their great and unique tool language. When acquiring knowledge we are mostly relying on others. Most of what we know comes from other people, especially through reading. But how do you know that what you read is in fact real knowledge, and not just some story? This raises the question: What is knowledge? When can someone say she knows X? When can you trust something as knowledge? Is there a difference between belief and knowledge? Or between knowledge and opinion? And what *is* this difference?

Traditionally a lot hinges on what the source of a piece of knowledge was. Was it a person you can trust for instance? Someone of good standing, morally impeccable, this was what the Greeks thought provided a good source of knowledge. What you learned from him was truth. In other cultures the main source for the truth of an idea is God. God revealed his truth in a text, such as the bible. What else would be the best source of knowledge but the word of the creator of the universe?

Science, it is argued, grounds the truth of knowledge in observation. It's claim to be different from other belief systems rests on the fact that it is based on observation. But not any kind of observation. Observation must be objective: it is not blinded by prejudice or by current opinions.

Saying that science has its basis in observation is only half the story. What sort of observations? Under what circumstance must these be gathered? May we use instruments? If you say yes, then this raises the question of the function of such instruments. Are these extensions of our senses? Or do they radically change our observations? Galileo Galilei, one of the founding fathers of modern science, talked about correcting our observations through instruments. Take a good look at the biomedical scientist below, involved in a scientific experiment, a typical form of scientific observation. She is *observing* nature. But, is she *looking at nature*?

She is a recent link in a chain that goes back to the 17th century, when Francis Bacon asserted that true knowledge has to be wrestled from Nature. She does not give up her secrets without resistance. If you want to know the true nature of a lion you have to pull its tail. If you want to know nature you must perform experiments, a bit of an equivalent to using instruments of torture



Readings

Chalmers chapters 1, 2, 3.
Reader nr. 1
Total nr. of pages 37+13 = 50

David Hume, the terror of induction

2. From the facts upward

Do we know more than people did in the past? Nowadays we tend to say yes. However, just 500 years ago, most people believed that the best times were behind us: Paradise (from which we were evicted); classical Greece (Whose wisdom we never could equal). For this reason alone it was hard to imagine that in the 16th century new things were discovered. Even Newton believed he was rediscovering ancient knowledge through the intervention of God.

Francis Bacon gave an answer that provided some consolation: We know more because we use the scientific method. Scientific method gave a democratic tool for discovery. 'My method has levelled man's wits.' Bacon wrote with pride. That method was induction from observations to laws and theories by a researcher who had cleansed his mind of idols and prejudices. However, induction had problems that not long after Bacon's days were pointed out by David Hume.

Scientist After heating a thousand pieces of metal, and seeing that they all expand upon heating, I believe it safe to say that metal always expands upon heating. The history of science is replete with examples of the inductive method. Take the great medical doctor Semmelweis, who against the prejudices of his age, through careful observation isolated the cause of puerperal fever and provided a way to prevent this dreadful disease.

Sceptic You are perfectly entitled to feel whatever you want, but I see no logical reason for such arguments to be valid. Going from particulars to a general conclusion is never a valid argument. Ever since Hume this has been clear. Semmelweis is a good example of that. From his observations he inferred a nonsense theory, even though his prophylactic measures were correct.

Scientist But science has used this principle of induction for ages, and it has proven its worth thousands of times.

Sceptic I see you do not even mind to use a circular argument, or to be beamed up by an infinite regress to plead your case.

Scientist Natural selection has made us into inductive inference machines. Whatever logic you apply, nature made us reason from one observation tot the other, and to believe that the future will be more or less the same as the past.

Sceptic No! Evolution does not proceed inductively. Natural selection is not inductive at all, on the contrary. Rather it operates deductively by weeding out the unfit. The next problem will make this clear!

Readings
Chalmers chapter 4
Reader nrs.14 & 19.
Total nr. of pages 17+ 8 +4 = 29

3. Explanation by law

Why is the sky dark at night? Why does a skater, performing a pirouette, increase the speed of rotation when he draws in his arms? Why does the temperature of a gas rise when it is compressed? Why does it often happen that people who witness an emergency do not help, even though there are scores of people present? Why does the sun *seem* bigger at sunrise and sunset than during the day? Why do people start reading advertisements for a car after they have bought one (instead of before)? Why do married people consider the beauty of their partner less important than people that have yet to marry? These are all 'why questions' relating to phenomena begging for an explanation. We want to know why something happens.

On the traditional empiricist view, gathering scientific knowledge means systematizing patterns of observations into laws. Once we have isolated these laws, we can explain things: we logically derive from laws in conjunction with relevant facts predictions (before the fact) and explanations (after the fact). The classical model along those lines was put forward by Hempel and Oppenheim. Of course it has not been without problems.

For instance, what to do with laws that are of a statistical nature? The explanation for some of the questions above relies on statistical arguments. Or: What to do with events that are singular one-time occurrences? A mass-extinction in the course of evolution for example.

So, there may be different types of explanation in science, each with a specific structure.

Newton, who originated the most successful theory ever, a theory that dominated physics for 200 years and was the source of innumerable explanations

Readings

Reader nrs. 13 & 26
Total nr. of pages 35 + 23 = 58

4. Trial and error

At the end of the 19th century many physicists believed their knowledge was almost complete. Throughout physics, the theory of Newton reigned. By 1900 Newton's theory was over 200 years old. It had guided celestial and terrestrial mechanics with great success. It was not at all surprising that many scientists not only believed this theory to be well confirmed, but held it for the truth. With Newton science had reached both certainty and truth. In the first decades of the 20th century, this framework was wiped away by Einstein's theory of relativity and by quantum mechanics.

No other philosopher picked up the message of this so decisively as Karl Popper. He built a new criterion of demarcation between science and non-science on these developments; he devised a sophisticated methodology that does away with all forms of confirmation. Positive proof for a theory does not count. Instead Popper puts forward falsifiability: the method of science is to eliminate theories through severe testing. Hence Popper stresses the critical nature of science; only by criticizing ideas and theories can we eliminate error and achieve progress. All knowledge, however secure it may seem, is fallible. This goes against the core of the common sense idea of knowledge, where knowledge is a state of mind. Knowledge is associated with certainty. The better we know something, the more certain we feel about is. Popper turned this around. Our best knowledge is the least certain.

Popper does seperates knowledge from subjective belief. Only after we have objectified knowledge it can be criticized. Your subjective beliefs are yours and yours only. Once you have written them down however they take on a life of their own. Other people may take them up, and discover things in them you never even surmised. To do justice to this characteristic of objective knowledge Popper developed his theory of three interacting worlds (the physical world, the mind and the products of the mind).

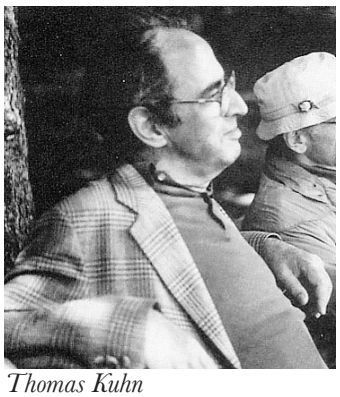
Back to science. By promoting falsifiability to demarcate science from non-science, Popper now also had a criterion to demarcate good and bad science. Good scientists will test theories and strive to falsify them; bad scientists will try to protect their beloved theories from being falsified. Notably psychoanalysis and Marxism for Popper put a wall of lame excuses around their ideas to avoid falsification. So, these fields are not really sciences at all. .

Karl Popper, around 1930, when he was working on his 'Logic'

Readings

Chalmers chapters 5, 6
Reader: nrs. 24 & 25
Total nr. of pages 26 + 31 +25 = 82

5. From logic of science to history and sociology of science

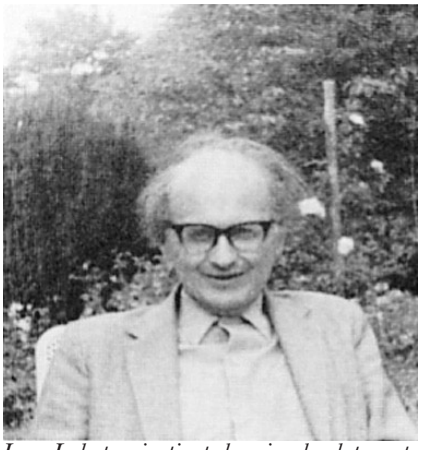

Thomas Kuhn

Logical empiricism had sung the praises of confirming statements; critical rationalism had argued forcibly to forget about confirmation and focus on falsifying theories as the engine of scientific method. Then in 1962 a well known historian of science debunked both confirmation and falsification. Maybe it seemed sometimes that scientist were following these two opposed methods, but this was indeed only appearance.

Kuhn offered a different theory altogether, even doing away with one of the most cherished aspects of science: its critical nature. Scientist are open minded, critical seekers of the truth, the received view argued. Not really, according to Kuhn. The aim of science, or rather of scientists, is not finding the truth, but solving puzzles, a term Kuhn deliberately uses to mark the distinction with problems. The latter according to him have no real place in science. The new concepts were: scientific community, paradigms, normal science, crisis and scientific revolution. From these building blocks Kuhn constructed a sociological and very historical theory of science.

This model worried many philosophers of science, not least the critical rationalists who strongly believed that science could lead to real cognitive progress in a rational way. For them scientists accept or reject theories on the basis of rational arguments. For Kuhn accepting a theory was more like a religious conversion, a sudden uncritical switch. This went against the very core of critical rationalism and hence this became the main defender of progress and rationality in science.

The most important thinker to assimilate Kuhn's new model of science was Imre Lakatos. He incorporated the essence of Kuhn's theory in his methodology of scientific research programmes. In the course of this he gave a new twist to the notion of falsification (here he followed leads Popper had given) by stressing the vital importance of successful prediction of *new* facts in the growth of science. To understand progress and rationality of science, one needed to take the long view, the historical view Kuhn had introduced so forcefully. However in this new situation the rationality of science had to be content with a much more modest position.


Imre Lakatos, instigated major developments within critical rationalism.

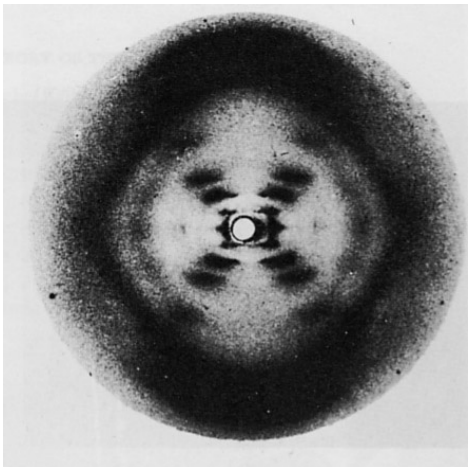
Readings

Chalmers chapter 7, 8, 9
Reader nrs. 20
Total nr. of pages 57 + 14 = 71

6. Realism: to be or not to be

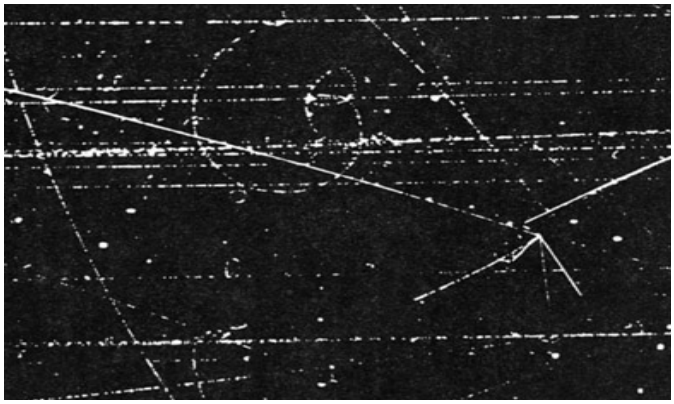
After Copernicus put forth his theory that the sun was in the middle of our planetary system, and that the planets, including the earth, revolved around the sun, Cardinal Bellarmino argued that a theory could be a useful instrument for making astronomical calculations, but that this did not mean that the theory gave an accurate picture of the world. Such a theory need not have any reference, need not correspond to reality to be a useful prediction and explanation machine. For Bellarmino the bible gave the true, picture of the universe (earth centered), but Copernicus was better for predicting the positions of the planets. In the 19th century the Austrian physicist Ernst Mach opposed atoms on similar grounds. Atoms did not exist, but were useful figments of the imagination. For Mach the success of a theory was no proof atoms existed. Belief in them was believing in a metaphysical system, unworthy of a scientist.

However, most practising scientists have been and are realists. For them a scientific theory *has* reference, gives us a 'picture' of reality. The sun *really* is in the centre of the solar system, atoms and subatomic particles *really* exist. The fact that our theories are approximately true, explains why they work. Realists have faced serious problems. What about all the discarded theories of the past, that gave partly correct explanations? Take the caloric theory of heat, which could explain quite a lot of phenomena by assuming the existence of a 'heat-stuff', the so called 'caloric' flowing between differences in temperature in bodies. But if we are right, there is no caloric, there never was and there never will be. What was the referent of 'caloric' in the caloric theory of heat? Should we not distrust theoretical concepts on this basis, and put our stock mainly on the observational level in science?



Below: Observing elementary atomic particles in a bubble-chamber. Food for realists.

Above left: Roentgen diffraction pattern of DNA. This B-form, photographed by Roslind Franklin, 'clearly indicates a double helix', which was then constructed by Watson and Crick (above right).



Readings

Chalmers chapter 15
Reader nrs. 4 & 8
Total nr. of pages 18 +7 + 6 = 31

7. Growth of science

It has always been held that in science we know more now than we did in the past. We have better theories, explanations and predictions. Newton's theory of celestial mechanics is better than Kepler's; Lavoisier's theory of oxygen is better than Priestly's phlogiston theory; Darwin's theory of evolution is better than Lamarck's. In science genuine progress is being made, and this is what makes science unique.

As a contrast, in ethics, or in politics, it is much more difficult to say that our present ideas are better than the ones people held in, say, the 16th or 18th centuries. They sure are different, but better….? If someone would say that our ethics or politics are better, it would have to be possible to rank the various views. However, which yardstick would we use? That of our present views? There seems to be no yardstick independent of our own views on ethics or politics, and hence each view is closed up in a universe of its own. Science was always supposed to be the exception. It was the exception because in the end it was based on the truthful registration of the world through observation. *That* demarcated it from politics, religion or ethics.

Kuhn undermined this idea. In the early fifties of the last century Thomas Kuhn was studying the physics of Galilei and of Aristotle. The traditional view was that Aristotle was just wrong; Galilei was the first *real* physicist. As Kuhn was going over their ideas, all of a sudden something snapped. He experienced a Gestalt switch, as when you see an ambiguous picture like the one of the duck/rabbit. He realized that Aristotle was a good physicist, but one completely different from Galilei. They were aiming for different targets, and hence their views could not be compared. Their views were *incommensurable*. However, once he realized this, what about Darwin and Lamarck? Were they also living in different universes? And other scientific theories, research-programmes or paradigms? So, is our present day science better than that of the past. Well, of course, if we use our present views as yardstick, it is. But is this fair? What constitutes scientific progress? What could be an independent yardstick for science? For Kuhn, one answer was quite straightforward: The scientific community says our theories are better, what other criterion could there be?

The ambiguous drawing of a duck-rabbit

Readings

Chalmers chapter 6, 10 & 11
Reader nr. 22
Total nr. of pages 12 + 23 + 20 = 55

8. Explanation in the social sciences

Modern science started in the 16th century. The scientific study of man and society began a bit later and gave rise to a new set of philosophical issues, some of which we will deal with in the next problems. In problem three we looked at scientific explanation: a (set of) law(s), together with initial conditions deductively provides an explanation. Upon heating, a piece of metal has expanded. We explain this by recourse to the law 'All metals expand upon heating' together with 'This is a piece of metal that has been heated'.

Laws are essential to any explanation, both in the natural and the social sciences. If social phenomena were not ruled by laws, how could we provide explanations? This touches upon the essence of science: If the world would be random, without regularity, it would be impossible to explain anything. Prediction requires regularity of the world.

However, even if we agree on this, there are still issues as to what *kind* of explanation we need in the social sciences. One issue revolves around the level on which we explain human behavior: social structure or the individual.

Structuralism looks for laws at the level of society. It is the structure of a society that determines the behaviour of individuals. Treatment of women can be explained by the patriarchal structure of a society. The voting behaviour of person X is explained by the socio-economic class he belongs to. Even the most essentially individualistic act - a person committing suicide - obeys structural sociological laws. Durkheim's research into suicide set out to demonstrate this. What he showed was that this most individual of all human acts follows laws. The more integrated a society the less often people will commit suicide; in social systems where people's lives are less integrated in a group there will be more suicides. This explains why among Protestants there are more suicides than among Catholics. The broader issue here is: what is the status of such structures? Are they real? Durkheim thought so, and founded the discipline of sociology on the existence of what he called 'social facts'.

This has the appearance of real science, but there is a striking difference between concepts referring to social structures and most concepts in the natural sciences. For a concept like 'mass' we can easily pinpoint real references, but for a concept such as 'socio-economic position' or 'patriarchal structure' this is much more problematic.

This is one reason why *individualists* reject social structures as real 'things' and refuse to use them to explain individual behaviour. For individualists 'society' is a catch-phrase for the sum of all individual actions. Talk about a social system determining individual behaviour is misleading at best. It reifies society into an independent being. Society does not exist independently of the individual actions making up 'society'.

Individualists start with the laws that govern individual behaviour, and from these explain the characteristics of the system. Economics is a prime discipline here, especially when it focuses on the unintended consequences of individual action. By the simple act of entering the market with the intention to buy something an individual contributes to a higher price which of course is the last thing he intends. The macro-economic phenomenon of rising prices is determined by nothing more than the sum of all individuals active on the market. Individualists have the tricky task to show how from laws governing individual behaviour general characteristics of a society emerge, like a political system, or a system of kinship. No easy task.

Readings

Reader nrs. 5, 15, 16 & 17
Total nr. of pages 10 + 22 + 20 +27 = 79

9. Is an economic crisis like a solar eclipse?

In 2008 the financial crisis started to cause havoc all over the world, and soon journalists began mocking economists: why had they not been able to predict this crisis? What kind of science was this, that, at the moment when it really counted, was as ignorant as any lay-person? Many people expected economics to be like physical science. That is what science is for: predict an outcome so we can take measures to avoid unwelcome results. Knowledge is power over the uncertainties of the future.

Such people's expectations were similar to what we have come to expect of astronomers. If they say: "There will be a total solar eclipse on august 12th 2026" this is a precise prediction of a future event. As it is a prediction made by astronomy, most people will have great confidence in it. It is a prediction of an event that is certain to occur. It is not the case that the certainty that the event will take place is going to increase over time. The certainty that it will happen is 100% now and this will not change. No use betting on it.

Many people have been striving for a similar certainty of prediction for human behavior. Social science should emulate physical science or be doomed to irrelevancy. As one 20th century sociologist formulated it: "The most important goal that sociology has set for itself is to predict future development and to shape the future, or, if one prefers to express it in that matter, to create the future of mankind." (T.T. Segerstedt).

However if someone says "A new constitution of the European Union will be agreed upon on august 12th 2026" this does not sound like the prediction of a solar eclipse. If someone had said 'The present economic crisis will be over by the end of 2014' again it seems different from what the astronomers tell us. Such propositions sound less like predictions and more like prophesies. Few people will have confidence in its occurrence and the certainty that such an event will actually take place will change over time and even depend on who gives the answer. In both cases things are highly uncertain. Which of course is also the reason why some people make a lot of money (or lose it) waging bets on the financial markets that an event will or will not take place.

So, what makes such things so different? Is it in the nature of things? What is so fundamentally different here? One thing is clear: There may also be a difference in what the effects are of a prediction. Between the prediction of a solar eclipse and the prediction of an economic crisis there will be great differences in the effect. Even when the prediction turns out to be completely wrong. Again that seems a hallmark of social science (and of society!).

Readings

Reader nrs. 11, 12, 23 & 25
Total nr. of pages 6 + 12 + 14 + 27 = 59

10. Understanding

You just heard a good friend has been hospitalized, and you decide to send her a 'Get Well' card. You want to uplift the mood of your friend so grab your pen and are in the process of writing something cheerful. Someone asks what you are doing. You will answer that a good friend is ill and you are writing a 'Get Well' card. This will feel both to yourself and to the person asking the question as an explanation of your actions. You have provided *reasons* for your actions and these have been *understood*.

Seems simple, but this brief everyday event is full of philosophical assumptions and is rattled by a range of problems. The relation between a friend's illness and your writing a card is not of the nature of a natural law, such as we use in the sciences to explain an event. In 6 months as another acquaintance gets ill, you might not send a card at all. The connection is not law-like. So one question then is: What is the connection? Are causes involved? But then, the connection between a cause and an effect is a necessary one, and we just noted that this is lacking here. At the same time you believe hearing of the illness of the friend *caused* you to write the card. What is up here?

Some philosophers have maintained that we have simply left the realm of the sciences, and have entered the domain of the humanities. Instead of laws we are dealing with meanings, instead of behavior we have actions. Over time philosophers have reconstructed this difference in terms of a method of understanding. This method serves as an alternative method for the humanities and (large) parts of the social sciences. The latter insight of course gives rise to the question: which parts?

We are still left with the issue of the relation between a reason and an action. What is this relation if it is not causal in the sense of the sciences? Some philosophers have reconstructed it as a logical or conceptual one. Others are simply still baffled by it.

Another issue is this: Meanings and actions are always part of a wider web. It is impossible to understand an action in isolation. Take the example above: you need to know about the wider culture to understand the custom of sending such notes. If you are a complete outsider you will not at all understand even this simple pattern of actions. No discipline has been more focused on this than cultural anthropology: you need to grow part of a culture to really understand it. You must live the life form. Context is king. Hermeneutics has systematized the implications of this awareness of context, both in terms of different cultures, but also over stretches of time. Understanding the art of the renaissance is similar to understanding the life of the Bushmen of the Kalahari. That is a perspective that unites the humanities.

Readings

Reader nrs. 2, 9, 10, 18, 28, 29 & 30
Total nr. of pages 58

11. Science, society and the rise of professions

You are studying an academic program and on your way to become professionals, active in society, in all probability full of desire to make the world a better place. Functioning in society, what will be the basis of your authority? Why should people listen to you? Why should the policies you help develop be implemented? Some of you are already actively doing this. Students have lobbied for computers to automatically shut down to save energy. The green office is trying to help limit the effects of global warming. But on what authority should we accept global warming or measures to fight it? Science? But what is science based on? By now you should be aware of all the problems raised around the cognitive authority of science. Accept X because the experts say so? Must we accept the ideas of the experts? Popper, Kuhn, Lakatos, should have shown you how fragile the claims of the experts are.

Note, we are still in the realm of natural science! This is the part of science that seemed for a long time to be solid. It's authority is supposedly based on reliable public observation and truth. What then will be the authority of the social sciences? An economic crisis requires action, but which action? Pump in more money? Force austerity? All parties claim they are right. Their advice is based on scientific knowledge so you better heed it. We live in a society dominated by experts and their authority is based on science. This was not always the case.

Once upon a time when you overate and became fat, you were a glutton, committing one of the 6 major sins. God would punish you in due time! Now, you are suffering from obesity, or from metabolic syndrome exposing yourself to health risks, and you might want to be treated for it by an expert, such as a psychologist. You used to be an unruly, pain in the ass kid, now you suffer from ADHD and you get medication. You used to be a sexist pig, now you have behavioral issues and you should see a counselor. From guilty of - and hence responsible for - your behavior, you have become a victim of it.

Increasingly since the 19th century the state is involved in all of this. The state bureaucracy hires experts -trained professionals - to treat its citizens or reform them and in the process redefines their individuality. The competence of the experts, the source of their authority, is based on science. State-science-power forms a triangle in modern society. And you, UCM students, future experts, will be part of it. In fact you will probably make a fine salary from it.

In his essay 'What is enlightenment?' The German philosopher Immanuel Kant wrote: 'Enlightenment means taking leave of your self-imposed ignorance'. Knowledge will make you free. This has ever since been the battle cry of progressive thought: science through gathering knowledge will create a better world to live in. Why else do science in the first place? Science will help to solve man's problems: disease, poverty, crime; it will bring happiness and health. Not for free of course. As collateral damage there will be less room for the freedom of the individual. It turned out to be a bit like what the American general in the Vietnam war said: To save the village we had to destroy it.

Readings

E-reader nrs. 3, 6, 7, 10, & 27
Total nr. of pages 8 + 18 + 12 + 17 +6 = 61

Readings

Below is the list of essential readings for the course. The articles and chapters have been annotated.

Textbook:

Alan Chalmers, What is this thing called science, Open University Press, Buckingham, 1999 or later.

Reader:

1. Louis Boon. Sources of knowledge - authority of knowledge (13 p.)
2. Louis Boon. Problems of the social sciences (26 p.)
3. Louis Boon, Introduction to System and lifeworld & Arthur Frank, Life world and system (8 p.)
   Explains the notions of system and lifeworld in relation to Habermas' analysis of Talcott Parsons' functionalist theory of society. Habermas argues that the systemic characteristics of society have colonized the normative sphere of the lifeworld. This theory builds on Habermas earlier ideas on technical and practical knowledge interests. See nr. 10.
4. Paul Churchland, The anti-realist epistemology of van Fraassen's Scientific image (6 p.)
   Do the things mentioned in our theories like atoms or electrons really exist? That is the issue of realism vs anti realism. Bas van Fraassen rekindled this discussion in the 80ies of the last century, and Churchland answers him for the realists. See also nr. 8
5. Emile Durkheim, Social facts (10)
   Classical formulation of structuralist explanations of society. Social facts are a reality of their own. The behavior and thinking of the individual is governed by these social facts.
6. Ted Fleming, We are condemned to learn. (18 p.)
   Applies Habermas ideas on system and life world to discussions on higher education, explaining these concepts, and the idea of colonization in the process.
7. Michel Foucault, 'The order of things' and 'Power/knowledge' (12 p)
   From within the strongly French tradition of structuralism Foucault does away with the subject. The first part focuses on the archeology of knowledge, the second on the genealogy of power through knowledge. These latter two concepts seem almost interchangeable. Foucaults significance in this course lies in the argument that science is not so much rationally grounded knowledge, but a source of power, suppression and 'normalization'. Foucault is the antithesis of for instance Habermas.
8. Bas van Fraassen, Constructive empiricism (7 p.)
   Important recent anti realist position, that restarted the debate on realism in the 80ies of the last century. Van Fraassen innovated on previous anti realist positions by introducing the concept of 'empirical adequacy' for science. Strictly spoken theoretical concepts do not have a descriptive function. We need them to organize experience, but for nothing more. Read nr. 4 after this article.
9. Clifford Geertz, The thick description of culture (4 p.)
   Argues for a conception of social science where understanding is at the centre. 'Thick description' refers to the intricate social and cultural context in which action gets meaning and must be understood.
10. Jürgen Habermas, Knowledge and human interests: a general perspective (16 p.).
    In the philosophical tradition Habermas stems from different types of knowledge embody different interests, such as technical, hermeneutical or emancipatory. Early formulation of

his theory before he fully reformulated it in the context of communicative action.

11. Friedrich Hayek, The Pretense of Knowledge (12p.)
    Nobel prize lecture (December 1974). Hayek here argues for the limited possibility of predicting social or economic events. The social science should not try to emulate the natural sciences in the field of prediction. The nature of the social world - organized complexity - makes htis impossible. all we can do is give global indications of what will happen.
12. Friedrich Hayek, The Use of Knowledge in Society (12p.)
    Hayek argues that knowledge is distributed throughout society and used by individuals in different contexts and ways. This means that a central overview, let alone control over knowledge is impossible. And as knowledge is a major factor in determining behavior, the prediction of societal phenomena is always rather restricted. we cannot gather all relevant information, and even if we could, we would not want to live in a society where this would be possible.
13. Carl Hempel, 'Two basic types of explanation', and two more essays on the concept of explanation (24 p.)
    Together with Oppenheim Carl Hempel wrote the classical article on the logical structure of scientific explanation. Here he gives an exposé of his position. traditionally the concept of a scientific explanation was viewed in terms of 'cause and effect' notoriously complicated concepts. Hempel and Oppenheim reconstruct that notion in terms of a logical (deductive or inductive) argument.
14. Carl Hempel, The role of induction in scientific enquiry (9 p.)
    Popular and simple explanation of the mature position of logical empiricism on induction.
15. Martin. Hollis, Problems of structure and action (21 p.)
    At what level do we explain human behaviour? Can we understand all social phenomena from the level of the behaviour of individuals, or should we look for explanations that use the level of social systems or functional explanations? Is the individual or the system the right level for social science?
16. Martin Hollis, Systems and functions (20 p.)
    Explains structuralism in the social sciences through functionalist explanations of the characteristics of a system.
17. Martin Hollis, Games with rational agents (25 p.)
    The individualist perspective is illustrated through game-theory, where rational agents create social characteristics, such as norms and values.
18. Martin Hollis, Understanding social action (10 p.).
    Overviews the different perspectives on human action with a range of interpretations of the concept of understanding.
19. David Hume, Induction (3 p.)
    The original argument against induction by the great Scottish philosopher. Neither reason, nor experience, can ever justify induction, i.e. reasoning from particular events towards laws or general statements. This is the argument that tormented Kant, and set myriads of authors to write about it.
20. Thomas Kuhn, The essential tension (15 p.)
    Science has been seen by many as the most innovative, critical and progressive human activity we know of. Kuhn however argues that for most of the time science is very conservative, sticking dogmatically to existing viewpoints, even in the face of negative evidence. Kuhn

maintains there are good reasons for this. The text is an early formulation of the tension between innovation and conservatism in science, later worked out in detail in 'The Structure of Scientific Revolutions'

21. Thomas Kuhn, The structure of scientific revolutions (8 p.)
    Excerpt from book of the same title, handling the main concepts of Kuhn's theory: paradigms, puzzles, normal science, crisis and revolutionary science. it is instructive to get a bit of the style of Kuhn's arguments through original texts.
22. Thomas Kuhn, Objectivity, value judgment and theory choice (19 p.)
    This article deal with scientific change, and especially the rationality or the absence thereof. If logic or methodology do not, and maybe cannot, determine the choice of theories, what does? Kuhn looks at methodology as a set of norms, but norms that can only be used as values, and hence can be interpreted differently by different individuals.
23. Karl Popper, Prediction and Prophecy in the Social Sciences (14 p.).
    Popper's interest in the social sciences originated in his worries about the limits of prediction in social life. He strongly believed that the future of society is open and hence it is not possible to make detailed grand scale predictions. These may seem scientific, but really are more like prophesies. Historicism as he calls it, such as Marxism, try to do exactly that: predict the future of society as a whole. Needless to stress that Hayek and popper are both very critical of Marxism.
24. Karl Popper, Conjectural knowledge (31 p.)
    Explains Poppers views on fallibilism and the growth of science through refutations, but also deals with stuff like empirical content and corroboration.
25. Karl Popper, Three Worlds (24).
    Most philosophers view knowledge as something a subject has. Not Popper. Here he defends an objective approach to knowledge, in which the subject is almost the weakest link in the process of acquiring knowledge.
26. Wesley Salmon, Scientific Explanation (35 p.)
    Review of the various positions on the logical structure of scientific explanation.
27. Tod Sloan, The Colonization of the Lifeworld and the Destruction of Meaning (2 p.).
    In: Habermas' colonization thesis for dummies
28. Charles Taylor, Interpretation and the sciences of man (5 p.)
    Pleads for the 'hermeneutical sciences of man' and takes issue with the logical empiricist approach to social science. 'Meaning' should be king in social science.
29. Peter Winch, The idea of a social science (6 p.).
    Argument for an interpretative perspective on the social sciences, based on Wittgenstein's philosophy of language. Reasons and actions are logically connected through the rules of a language game.
30. Ludwig Wittgenstein, Philosophical investigations (7 p.).
    A few bits and pieces of Wittgenstein's analysis of language and meaning, explicating important concepts such as language games, rules and family resemblances. Almost all recent theories of understanding as a method of research in social science base themselves on his analysis of language and rule-following

To think of nothing is metaphysics enough.

What do I think about the world?
Bugger all what I think about the world!
If I were ill I would think about that.

What notion do I have of things?
What is my opinion on cause and effect?
What reflections do I have on God and the soul?
And on the creation of the world?
No idea. For me thinking of such things is to close your eyes
And not to think at all. It is like closing
The curtains of my window (but there are no curtains in it).

The mystery of things? How should I know what the mystery is!
The only mystery is that there are those that think there is a mystery.
Who stands in the sun and closes his eyes
No longer knows what the sun is
And starts to think lots of things all full of heat.
But open your eyes and look at the sun
And immediately you can no longer think of anything,
For the light of the sun is worth more than the thoughts
Of all the philosophers and all the poets.
The sun does not know what it does
And therefore it cannot be wrong and is common and beautiful.
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