So without further ado, let's go straight on to induction. You'll see that here there are a lot of things in common with the material we've just covered, so some of that I shall go over quite quickly. However, the handout aims to be relatively self-contained so that you can look at it separately. The people shown here: we've got David Hume on the left, Peter Strawson who was at Magdalen for many years and I think started out at University College, so he's very much an Oxford man. Hume, Ella, until recently a professor at Cambridge, and Nelson Goodman, famous author of the Goodman paradox.

Now, the main historical reading that you will get on induction is David Hume's inquiry concerning human understanding, section four. And the discussion there starts with a vital distinction, a very, very important distinction and one that has remained of tremendous importance, though its exact formulation has changed over the years. Hume draws a distinction between relations of ideas and matters of fact.

Well, what's a relation of ideas? Well, think, for example, of this proposition here: all bachelors are unmarried. Okay, so we've got certain ideas, like the idea of a bachelor, the idea of being unmarried, and we can see just by looking at the nature of those ideas what we understand by them. What do we understand by a bachelor? Well, an unmarried man. If that is our idea of a bachelor, then we can see just by consulting our own ideas that all bachelors must be married. "Three times five equals half of 30" – that's one of Hume's examples. Simply by examining our ideas of three and five and multiplication, etc., we can again see that that is true. More complicated example: Pythagoras's theorem. It seems that the proof of Pythagoras's theorem comes pretty much from just consulting the ideas of a Euclidean triangle, the axioms of Euclidean geometry, and simply doing inferences from those. So these kinds of propositions are for Hume relations of ideas. The more modern term is analytic propositions, ones that can be known, if you like, purely by analyzing the meaning of the terms.

And Hume draws a distinction between relations of ideas and matters of fact. Now, matters of fact are things that we cannot know to be true or false simply by consulting our ideas. So he gives examples like "the sun will rise tomorrow," "the sun will not rise tomorrow." Those are things that we cannot know to be true or false just by thinking about our ideas of what the sun is. If we take a pen, hold it in the air, and let go of it before it's fallen, the proposition that it will fall when released is a matter of fact. It doesn't follow from the idea of a pen, from what we understand by a pen, from what we understand by releasing it in air. It's not a matter of logic that the pen must fall; it's a matter of fact. The modern term for that is a synthetic proposition, a proposition whose truth is determined by the facts of experience rather than what we mean.

This raises a natural question: some matters of fact we can know to be true, or we think we can know to be true, just by perceiving them. I can perceive the lectern directly in front of me, so let's not worry about that. I can remember that it rained last week, not gonna worry about that. What about matters of fact that I don't directly perceive and that I don't remember? How can I possibly know anything about those? And now we come to that example that's been mentioned before, of the billiard balls: paradigm example of a matter of fact. I see a yellow billiard ball moving towards a red one. I suppose that when they touch, the red one will move. But that it will

move is not a relation of ideas. It cannot be known to be true just by consulting my ideas of billiard balls and movement. It's a matter of fact, and I can't see now that it's going to move. And I clearly can't remember its movement because we're talking about something in the future. So it's just an example of the kind of matter of fact that Hume is talking about.

So why do I suppose that the red one will move when the yellow one hits it? According to Hume, the only way we can ever draw any inference to a matter of fact which we don't either see or remember is by relying on causal relations. So then we get to this famous thought experiment. There's Adam, as painted by Michelangelo. Adam has just been created by God. He sees one billiard ball moving towards another. Put yourself in his position. You have no experience at all to call on. You've never seen anything like this. You are asked to predict what will happen when the first ball meets the second one. How could you possibly proceed? According to Hume, as we've seen, you couldn't. You would have no idea what was going to happen. Maybe when that ball hits that one, it will just stop. Maybe it will explode. Maybe it'll go right through it. Maybe it'll turn into a frog. Who knows? Without experience, you have no basis for any prediction.

So that means that any inference to a matter of fact beyond what we perceive or remember seems, if you like, to be based on assumptions of causality. And all our knowledge of causal relations, such as with the billiard balls, comes from experience. Without experience, we can't make any predictions about what will cause what. And it seems clear that learning from experience takes for granted that observed phenomena – things that we've seen in the past – do provide a guide, a guide of at least some reliability, to what's going to happen in the future. So it seems that in order to make any prediction about the future, we have to take for granted, or we have to have some basis for extrapolation – extrapolation from our experience to the future. Because experience is our only guide.

Well, here's a passage from a letter from a gentleman to his friend in Edinburgh that Hume wrote in 1745. The context of this was that Hume was applying for a chair in moral philosophy at Edinburgh, and the clergy at Edinburgh were very much against him because they thought his treatise of human nature was atheistic. And so he wrote a letter trying to explain how the treatise wasn't nearly as bad as people thought it was. It's not exactly clear how much of this letter we should take as entirely ingenuous. Some of it might possibly be suspected of somewhat glossing over the truth. But at any rate, in that letter, he explained part of the background to his epistemological thinking.

"It is common for philosophers to distinguish the kinds of evidence into intuitive, demonstrative, sensible, and moral. When Hume talks about intuitive evidence, that is intuition-like, it means something that is immediately self-evident. So, for example, that something is identical with itself, 'I am identical with me,' '2 is greater than 1' – these are things I can know to be true just self-evidently. By sensible evidence, Hume means sensory evidence – the evidence of the senses. Demonstrative evidence: well, that's demonstration, logical argument. And by moral evidence, Hume means inductive reasoning – reasoning from experience. It's very important when you read the inquiry, notice that when Hume uses the word 'moral,' he does not mean ethical in the sense that you or I would mean by moral. So moral reasoning is reasoning about the world.

So here, Hume is drawing on Locke. We've seen before how Locke draws this distinction between demonstrative and probable reasoning. And we saw that for Locke, both types of reasoning involve a rational perception of the links. So Locke's view of demonstrative and probable reasoning, or demonstrative and moral reasoning, is that in one case, when we reason from one step to another in our chain of reasoning, we see a clear, evident connection from one step to the next. In probable or moral reasoning, when we reason from past experience, according to Locke, we see evidential connections, but they are only probable connections, not demonstrative ones.

Okay, with that background, let's go back to Hume's question. We want to know why the second billiard ball will move when the first touches it. We think that the only ground of such an inference is causation. We think that the only way we can learn about causation is from past experience. And we want to know what ground we have for extrapolating from past experience to the future, for expecting that the causal laws, if you like, that applied in the past will apply in the future. What ground have we got? Well, is it self-evident? No, it isn't. Can it be demonstrated? Can you produce a logical proof that what's happened in the past will happen in the future? No, you can't because we can perfectly coherently conceive of it not happening. Do we have sensory knowledge? Can we see through our senses that what has happened in the past will happen in the future? Clearly not. What about factual inference – what about ordinary day-to-day inductive/moral reasoning? No, because that is the very kind of reasoning that we're considering. We're asking ourselves whether it is possible to extrapolate from past to future legitimately. So relying on that kind of reasoning to justify our relying on that kind of reasoning would be going in a circle.

So here, I give a very brief review of the argument of the inquiry. I'm not going to go through this now in detail, but when you come to Hume's texts, take a look at these slides and use them to inform your reading of these passages. That's a summary of the part 1 argument where Hume says that all factual inference is founded on experience. It follows that all factual inference has to be based on an assumption of uniformity – the assumption that what has happened in the past is a guide to what will happen in the future. And then we get the proof that we have no ground for making that assumption. So it seems, as we've said before, that all of our reasoning about the world, all of the reasoning by which we reach any matter of fact at all beyond those we immediately perceive or remember, is based on an assumption of uniformity – an assumption that what we have experienced is a reliable guide to what we haven't experienced. And if you ask Hume, that assumption is based on nothing at all other than animal instinct. There is no rational basis for it whatsoever. And that's the famous Humean skepticism about induction.

It's been an inspiration to huge numbers of philosophers of science. It was seen by many as a complete crisis, by some as an opportunity. The kind of philosophy of science that you find in Popper, to some extent in Kuhn, and many, many other philosophers of science takes its start from Hume's results. Popper, for example, tried to give an account of science which, in no way, depended on induction because he thought that Hume had completely undermined that basis. As I've said, it seems to imply that our human reason that we tend to be so proud of is actually different from animal reasoning only in degree – it's not fundamentally different in kind. The sort

of supposed perception of probable connections that Locke had thought was the basis of human reasoning turns out to be wishful thinking. There is no such perception. When we think that we have insight into the way physical things behave, at bottom there is this assumption of uniformity which is based on no insight whatever. And our understanding of causation is not really based on intelligibility, it's based on observation of uniformity.

Now, I'm not going to say very much about Hume's particular view of this, but just very briefly, does it imply a complete irrationalist point of view? If you go with Hume on this, does it follow that anything goes? That there is no difference between the scientist and the superstitious enthusiast who bases predictions about the future on the shape of the tea leaves in his teacup or on tarot cards or astrology or any other superstition you care to mention? Well, Hume didn't think so. He did deny that inductive inference is founded on rational insight. But he didn't want to say that, therefore, anything goes. But that raises a major problem of demarcation, and again, this is a problem that has echoed down the centuries since. What right do we have for preferring scientific reasoning to superstitious reasoning if the ultimate ground of scientific reasoning is just an animal instinct? So we have animal instincts to be scared of certain things or to have certain superstitions. Why should we give any less respect to those than we give to our animal instinct that underlies science? Well, Hume's answer is basically to favor consistency.

Hume wants to say that everything we do in life is based on the assumption that we can learn from experience and that the future will conform to the past. We can't even wake up in the morning, wash, go out the door, eat our breakfast without making assumptions. That the behavior of things in the past is a guide to their behavior in the future. Even the entirely superstitious person has to rely, in almost everything that they do, on that assumption of uniformity and systematic behavior. So Hume's answer is to say, "Well, in that case, the rational thing to do is to accept that. Accept that we are part of nature. Accept that this assumption is one that we simply cannot live without. And now follow through the consequences. And if you follow through the consequences, if you remain faithful to that assumption, that the basic laws by which nature works are consistent over time – since you have to assume it in your daily life – why not make that the model and then try and systematize what you discover about the world in conformity with that? That is where science comes from. And according to Hume, it gives a reliable basis for preferring science to superstition. But it does mean that our attempts to understand the world are reduced to the kind of thing that Newton did in the case of gravitation." The utmost effort of human reason is to reduce the principles productive of natural phenomena to a greater simplicity and to resolve the many particular effects into a few general causes. But as to the causes of these general causes, we in vain attempt their discovery. So we have to make do with the science in which the ultimate principles are ones that we just have to accept. And as I suggested in the case of quantum mechanics, that is, in fact, where we are. If you now look at what Hume has to say about science, a lot of it will look like common sense. At the time, it was very far from common sense. And it's a mark of how far we've come that we now accept that the ultimate principles of science are ones that we cannot hope to base on pure reason.

Okay, the last few slides, I'm just going to go summarize very quickly. Many people have attempted to answer Hume in all sorts of different ways. All I'm trying to give here is a little road map so that you can see where some of these attempts fit in. To discuss them with any sort of

depth would require at least another lecture or two, so I shall not attempt to do that. One way of trying to answer Hume is to show that actually induction can be justified by pure reason, but by appeal to probability rather than demonstration. Here are some of the famous names of those who've tried to do this, including Simon Blackburn and John Mackie, both Oxford philosophers in their time.

Other attempts to answer Hume include the so-called analytic justification of induction. This is associated particularly with Peter Strawson. The claim is that induction is rational by definition. When we think of what is a rational way to behave, basing your assumptions about the future on the past just is rational. To assume that what's happened in the past is a reliable guide to the future, that is just what the rational person does. How can we make sense of rational behavior which didn't do that? And so the claim is that no skeptical problem can be raised about induction in the way that Hume was thought to do.

Some philosophers have argued that induction can be justified by its past success. Inductive reasoning has always worked very well for us. It's worked in the past. It should work in the future, shouldn't it?

And the pragmatic justification of induction – attempts have been made to show that even if we cannot justify relying on induction by pure reason, we have pragmatic reason for doing so. Practical reason.

Briefly, I don't think any of these answers really hit Hume very strongly. He would agree that we describe induction as a rational way of behaving. He himself advocates that we rely on it. An inductive justification does just seem circular. It seems pretty obviously circular. I think, ultimately, it pretty clearly is circular. The pragmatic justification doesn't touch Hume's position because Hume himself, after all, says that we irresistibly, inevitably assumed that the future will resemble the past. Anyone who comes along to me with a pragmatic justification of induction, who tries to preach to me and tell me why I should rely on it, is wasting his time. I'm already bound to rely on it. It's the way I am. The only question is whether I will rely on it consistently.

And finally, I end with a couple of slides on Hume, Ella, and on Nelson Goodman. I'm not going to attempt to bring those into the discussion here. I've put them there because they are amongst the reading that you will get on this topic. And I hope that what I've written there will help you to assimilate those into the general framework that I've given you. Next time, we carry on with more topics on general philosophy. See you then. [Applause]