MC 240
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Princeton- Humanities 202

OK

CHALK

# DESCARTES' DISCOURSE I

I. Why read the Discourse?

2a conclusions
1a problems

II. Descartes' early life.

His times
His education
His first research

III. The first breakthrough -- Analytic Geometry

The achievement as mathematics
The achievement as method.

Humanities 202 -- Two Lecture on Descartes

Lecture 1 -- 18 March 1968 - 3/17/69

I. INTRODUCTION

1. Your reading assignment for this week is ~~, as I understand it,~~ Descartes' Discourse on Method, published just over 330 years ago, in 1637.

   a) It's to this work that I've been asked to address myself, and the choice seems to me thoroughly appropriate.

      i) No work in modern philosophy has been and is so widely read. (Modern here used in contrast to ancient and medieval, thus entire period since about 1500)

      ii) Probably its main competitors in the entire literature of philosophy are Plato's Republic and a few of his Dialogues.

      iii) People who have read ~~nothing more~~ any phil at all are likely to have read these, ~~and often nothing more.~~ and often almost nothing else.

   b) I suppose it's from this work as much or more than any other that people take their idea of what philosophy is like.

2. It's not, I think, a bad choice, in many ways a profoundly good one. But it is in one respect an extraordinarily odd one.

   a) ~~Late in my next lecture I shall suggest that Descartes in the Discours catches and emphasizes something about the nature of knowledge which is important and often ignored.~~

      ~~i) But what I'll then point to is not what Descartes says he's arguing for.~~

This went quite well. But:

1) The editor they sent had only the <u>Discourse</u> and a different preface.

2) I ran out of time at end and had to overcondense.

Second time thru this didn't go very well.

a) Personal reasons, but.

b) Still too long. Lost parts good, but badly noted.

c) Middle's pretty dull & beginning's not fascinating.

d) Cut it and splice it

a) ~~And~~ What Descartes says he is arguing for is something that very few people, philosophers or not, have really believed in any form so extreme as Descartes'. It's very hard to take quite seriously.

b) As the Introduction to your edition indicates, the Discourse has usually been read as the first great statement of the philosophical position known as rationalism.

i) All knowledge of the world, both inanimate and animate, can be gained by logical deduction from indubitable first principles.

ii) These are taken to be innate principles -- built into all men from birth, independent of either education or experience.

iii) Everything follows from them by pure deductive reasoning. There's know need to look around, to experiment or even to observe.

Review of Euclid as example.

iv) Probably none of you will be surprised to hear that, except for some of Descartes' own followers, very few people have ever quite been able to swallow that position.

c) In fact, today, there is a growing school -- to which both the author of the Introduction to your reading and I belong -- which insists that Descartes didn't believe quite this either, that HE WAS NO RATIONALIST. (I'll be spelling this out later.) Rationalism comes later.

i) But on any interpretation, he gives a gigantic role to the human reason operating from simple and clear premises, reason itself and for all, and he plays down the role of detailed observation and experiment though without rejecting them.

ii) Few subsequent philosophers have been willing to go even that far with him.

iii) One does not then read the Discourse to find out what most philosophers actually believe, or have believed.

3. Why then has it been read, and why should you read it?

a) In the first place, I suppose, because it's a particularly attractive piece of philosophical writing.

i) Not too long. Arguments relatively untechnical.

ii) Furthermore, just because Descartes starts by doubting everything that has previously been known and then starting from scratch, you can start from scratch too. Don't need prior acquaintance with philosophy to see what he's getting at. Thus it's accessible.

iii) In addition, it's far more personal and autobiographical than most philosophical writing. Does give an often exciting sense of what it's like to be a philosopher, to wrestle with philosophical problems.

iv) And I think it will give that sense even to those of you who share my sense that the Descartes who emerges from the Discourse is an almost incredible egotist and a good deal of a poseur, not at all an attractive person, though a brilliant one, and one who made a vast difference to the development of western thought.

b) In addition, there are substantive reasons for taking the Discourse very seriously. If Descartes answers have not been widely followed, his questions -- many of them new -- have been with philosophy ever s

i) To a considerable extent they are the problems of modern philoso, as they were not the problems of ancient & medieval phil. There's a watershed here.

c) One of my main objects today and in the next lecture is to indicate why this should be so, and why these problems emerged at just this time.

i) But I think I can usefully anticipate part of what's in my mind.

ii) If you knew something about the history of philosophy and looked only at the title of the Discourse, you'd recognize it as belonging in an old and honorable tradition.

iii) The concern with method is by no means new. Since Aristotle in the 4th century B.C., there have been many works which aimed to teach people how to draw sound conclusions. That tradition continues. Under what circumstances is A the cause of B?

iv) But if you read the work, you may realize that Descartes' most fundamental problem is less how to draw sound conclusions than how can there be sound knowledge at all.

v) How can we know anything? Particularly how can we have scientific knowledge? Why believe it.

d) And that problem, if not quite new, has never been central to philosophy before, or not in this form.

i) There have been people before who insisted that scientific knowledge was basically impossible. They emphasized, for example, the unreliability of the senses, using examples much like Descartes' -- dreams, optical illusions, illness. In a general way this had been Platons position. Since science had to depend on senses, there

ii) There had been others -- Aristotle as a primary example -- who took the possibility of science for granted and asked how to avoid mistakes. Methodological tradition follows from him.

iii) Descartes is perhaps the first of those who is, on the one hand, deeply impressed with science and, on the other, terribly unclear how there can be any such thing.

iv) More than anything else that's the problem of the Discourse, and under the name of epistemology -- theory of knowledge -- it's been central to philosophy since.

e) In a sense, though still an incomplete one, the Discourse is the first work on epistemology, but there have been many since. In many ways it's been central field of phil. since 17th century.

i) And they deal with many of the same problems.

ii) Granting the unreliability of the senses, taken literally, what can we hope to get from them as a source of knowledge?

iii) With this a second major problem that's been with us since -- the relation of mind to body.

iv) Knowledge is mental, consisting of interrelated ideas. But it's knowledge in part of bodies, of matter, and we gain it through the intervention of our bodies which are also corporeal.

v) How can the mental and the corporeal interact; how can there be two realms, a dualism, often known at the Cartesian dualism.

iv) Finally, to what extent can knowledge of nature and of man be like mathematical knowledge, deductive from first principles?

~~a Consequently: our ideas are related to bodies or objects, but how? Bodies are cold objects, oh. But there are other objects, like the human mind. Bodies have a mind-like character.~~

vii) That sort of knowledge is in some sense indubitable, but perhapd not about nature. Can we have similarly indubitable knowledge of nature -- science -- or is science intrinsically only probable, plausible knowledge?

4. All these problems, in forms only slightly different, remain central to modern philosophy. Discourse provides one of their earliest as well as one of their clearest, expressions.

   a) For these it's immensely fruitful reading, quite independent of Descartes' particular solution.

   b) Look for the problems, for it's these, I feel sure that you'll particularly be dealing with in precepts.

      i) They're not easy, nor unimportant, and they're still with us.

   c) Lectures should serve to clarify a few of them, but I shan't take that as my major object.

      i) Instead shall pose for myself the more historical questions.

      ii) Why do they emerge so forcefully as problems at just this time?

      iii) What aspects of Descartes' particular experience help to determine his particular solution.

      (iv) what does the result do to and for philosophy.

   d) One can fruitfully read the Discourse without answers to these questions, and most people do.

      i) But when it's read that way, there are important elements that do not get fully understood. It's this. I'm mostly after. Also, why [illegible]

## II. DESCARTES' EARLY CAREER

1. I can best approach my central problems by telling you first something about Descartes himself and about times in which he lived.

   a) Then try to outline the stages in the development of his ideas during the period before the publication of the Discourse.

      i) What lies behind the particular doctrines which Descartes' develops?

      ii) Balance of the latter and most of work

2. And here I begin with a date, 1596, which many of you will recognize as the year of Descartes' birth.

   a) But also a date midway through a period of gigantic social and intellectual upheaval.

      i) That's a subject for a course by itself, but I remind you of a a few of the central intelledtual elements.

   b) 1596 is just over a century after the discovery of the new world.

      i) Intervening period has been one of exploration and discovery of previously unsuspected places, ~~and~~ people, and things.

      ii) Physically and mentally horizons have suddenly expanded.

      iii) Economically also. Gold from the new world is one primary cause of a great economic boom which also brings wealth to new classes of people. Change, social structure and political organization of Europe

   c) In addition it's a time of great religious upheavals.

      i) Luther died just fifty years before Descartes' birth, but the

Protestant Reformation which he began has grown steadily stronger.

ii) Only in Descartes' lifetime does the Catholic Church begin its counteroffensive.

iii) Condemnation of Galileo in 1633 is one aspect of that reaction, and it has ~~as we shall see,~~ a decisive bearing on Descartes' development and publication.

(v) with both just published works. Discourse and Essays replace it.

d) In other fields, too, there's rapid change, but I'll mention only the central one -- in the sciences.

i) Copernicus' de Revolutionibus published in 1543, fifty-three years before Descartes' birth, and is only beginning to become at all popular, even among learned, in his lifetime.

ii) Kepler and Galileo, the men who do most to make idea that sun not earth is at center, plausible and effective astronomically are older contemporaries of Descartes'.

iii) Francis Bacon's call for a new science based on a new method is published while he's at school.

iv) Newton is born when Descartes'is in his forties.

e) This is the context in which, without further elaboration, you must place Descartes.

i) Already it should begin to be plausible that what we now think of as beginning of modern philosophy -- break with antiquity and Middle Ages -- should occur in these years.

ii) It's happening in many other fields too. Particularly intellectual realm and above all in science.

3. Returning now to Descartes.

a) He's born into a well-to-do family with some intellectual pretensions

i) Grandfather a doctor.

ii) Father a well-known counselor to Parliament of Brittany. Much legal training.

iii) Money sufficient so that Descartes can be given the very best education available and so that -- once he decides to devote himself to learning -- he can support himself on his inheritance.

iv) Though not a wealthy man, he never needed to work, which answers one of the questions his autobiographical remarks in the Discourse ought to suggest.

b) Serious education begins at age 10 when he enters the famous Jesuit college at La Flèche.

i) Rigorous training -- the best there is -- in classical languages and literature, in philosophy, mostly Aristotle and the Scholastics in logic and in mathematics, including both geometry and algebra.

ii) It's a relatively traditional sort of training, but La Flèche is by no means insulated from what's going on in outside world.

iii) Galileo's telescopic discoveries are reported there and create a stir Descartes never forgot.

iv) This is his main occupation until 1614 when he graduates. Then does two years of law at Poitiers, receiving his professional degree in 1616. This be [illegible] as end of his youth.

c) At which point he immediately abandons the family profession and resolves to travel, meet people, work by himself.

i) One of places to which he goes is Holland, and here he meets a man whose influence on him seems to have been decisive.

ii) Physician Isaac Beeckman, who seems to have been one of the most adventuresome and original minds of his day.

iii) He encourages Descartes to set down his ideas, gives him some new problems to work at, and is probably the man who converts Descartes to atomism -- an aspect of his work to which I'll be coming back at beginning of next lecture.

d) And it's from Beeckman, who kept a detailed diary in which he entered a number of the things he learned from Descartes and discussed with him, that we get our first notion of what Descartes had been doing since leaving school. 1616-18.

4. It's interesting work, showing much originality and promise. But there's a good deal else like it going on at the time.

a) A treatise on musical theory, the scale and harmony -- a highly theoretical subject at the time.

b) A number of pieces on simple machines, mechanics, and a very interesting discussion of the problem of free fall.

i) Result is the same as Galileo's first result and is not quite right. Get's distance proportional to square of time, but from velocity proportional to space covered rather than time.

c) And quite a lot of interesting but not earthshaking mathematics.

5. All that comes from period before end of 1618. Then, early in 1619, Descartes reports a discovery that is shattering, and from which much follows.

a) It's again in math, this time the discovery of what we should call analytic geometry.

i) It's at this point that he's gotten at least the basic ideas and some of the results which he published in his Geometry, the second of the three essays which appear in 1637 with the Discourse as preface.

b) It's a vital development in the history of mathematics, but in that respect it doesn't much concern me here.

c) But it's also decisive for all Descartes' subsequent work in science and philosophy, particularly for his method,

i) Therfore now desert the biographical mode, and try to see what Descartes thought he had found, and why it was so important to him.

III. THE IMPORTANCE OF ANALYTIC GEOMETRY

1. Until just about the time of Descartes' birth, there had been three quite distinct forms of mathematics known in Europe.

a) Arithmetic -- art of computing with numbers -- no more about it here.

b) Second is, of course, geometry. Modelled on Euclid and his successors who have made of it a discipline for which modern school geometry scarcely prepares you.

i) Does, however, deal with figures that can be constructed with a straight edge and compass.

ii) And proves theorems about these figures by deductive reasoning from what are essentially Euclid's axioms and postulates.

c) Finally, there's algebra, which has a history even longer than that of geometry:

i) But which the Greeks have ignored almost entirely.

ii) It's development has been largely due to Arabs.

iii) And when it's first known in Europe, it's treated in almost total independence from geometry, another subject entirely.

2. Particularly after the development of printing which aids the spread of a general and standard symbolic notation, Europeans show great originality in algebra. More so than in geometry.

a) By the late 16th century people are increasingly noticing that you can use it to solve a lot of otherwise very abstruse geometrical problems. Walls between disciplines are breaking.

b) No one before Descartes sees the full generality of the technique, and only one other man, of whose work Descartes is initially unaware, gets as far as Descartes does.

i) But if you look at the mathematical literature of the early seventeenth century -- Descartes' school days -- it's clear that analytic geometry is coming fast.

ii) Though no one quite sees ~~it as~~ what D does. There are lot of spec. ca

c) What is it then that Descartes sees and gets so excited about.

i) First and most important: That every geometric figure in two or three dimensions can be represented by an algebraic polynomial in two or three variables. $x^2+y^2=r^2$

ii) Second, that there are lots and lots of curved lines and surfaces which, though not constructible with ruler and compass, can be generated algebraically. Using algebra, the subject matter of geometry can be vastly extended.

3. Today, of course, we take this for granted, at least by high school.

a) Except for one hint, I'll not try to indicate why it was so hard to see in the seventeenth century. But it was terribly hard.

i) One central problem is that, in geometry, if A is a line length, _____, then A x A is an area, and AXAxA is volume of a cube.

ii) It's nonsense to form a polynomial by adding lines, to areas to volumes.

iii) Recognition that this can be done quite generally is exciting and does transform mathematics.

4. But what excites Descartes about the discovery is something more than this

a) Consider a standard late Greek geometrical problem:

i) Three (or more) lines given in position Draw.

ii) From P draw perpendiculars to lines Draw.

iii) Ask for locus of all points such that A x B = k x C.

b) For more than two lines, this gets very messy to handle by standard geometric techniques.

i) Centuries of work have led to understanding of only a few special cases.

ii) On the other hand, Set it up algebraically, and you immediately get a set of simultaneous equations.

iii) But you know all about simultaneous equations.

iv) Can immediately tell when they're soluble, when not.

v) And can always grind out a solution.

c) In short, what Descartes sees that he's got in analytical geometry is a METHOD

i) One which will tell him what problems have solutions and what do not.

ii) And one which will enable him to grind out solutions to all the problems which have them.

5. This is Descartes' idea of what a method is.

a) Initially only for geometry, but ~~within the year~~ very shortly he's talking also about a Universal Mathematics, one which will do the same thing for physics that's he already done for mathematics, and will do it also for other sciences.

b) Furthermore, the resemblance is not only in power but in detail. Other things besides area, lengths, and volumes are to be represented

by lines, compounded algebraically, and solved by the manipulation of simultaneous equations. D. Th. for motions, for colors, for temperature,

c) Won't see this in the Discourse, which is a highly abridged account.

   i) But it's quite clear in an earlier treatise on method which Descartes ~~publishes~~ fails to finish and which is only published posthumously.

   ii) And it's one of the reasons whyDescartes puts his Geometry into a book for which the Discourse is a preface.

d) Of course it's a grandiose plan, and of course it's unsuccessful. BUT

   i) If one thinks of the claims made for modern computers, it may not seem quite so mad.

   ii) Only, Descartes has no computer, and we're therefore left with the question., Why did he think it would work?

   iii) This brings us to another aspect of Descartes' thought, the one with which I'll begin next time.

# DESCARTES' DISCOURSE II

I. Desc's Atomistic Physics

II. Its impact on his philosophy

Method as Universal Mathematics

From method to epistemology

III. ~~What is Desc's Method?~~ Desc's Epistemology

Talk just a few wks..

Humanities 202 -- Descartes · Disc. II

Lecture 2 -- 3/20/68

I. DESCARTES' ATOMISTIC PHYSICS

1. At the end of my first lecture I discussed Descartes' invention, early in 1619 when he was just twenty-two years old, of analytic geometry.

   a) Suggested that it's primary importance for him was that it provided an infallible method of deciding which geometry problems were solvable and which not.

      i) Also gave a routine method, simultaneous equations, for solving them.

      ii) More probl. solving procedure.

   b) More than that, however, it led him to suppose that a similar algebraid method, or algebraic-geometric method would work for all the sciences. That what method is supposed to be. Not clear in Discourse which is considered. But its only Geometry in Text. Are in earlier version.

      Universal Mathematics

      i) I closed by asking, why should he have thought anything of the sort. What leads to this question

      ii) And by suggesting that answer depended on another quite different aspect of his thought.

      iii) One to which he was probably introduced by his close friend Isaac Beeckman in 1618.

2. Beeckman is one of a number of men who, at the beginning of the seventeen century, have turned from the increasingly discredited physics of Aristotle to another model of the universe also outlined in antiquity.

a) Basic ingredients of the universe are atoms and the void.

i) Where atoms are indivisible microscopic particles and the void is empty space in which they swim.

b) Those who take up this view in 17th century do not always insist that the particles be indivisible.

i) A few of them, including Descartes later on, do not even insist that there's a void.

c) But they all share a set of ideas that dominate Descartes' thoughts in this area from about 1618 and that he does a great deal to popula-

i) The infinite universe -- what's to bound it.

ii) Qualitative neutrality of atoms -- They have size, shape, position, motion, but not color, temperature, smell, and so on.

iii) They have, that is, only the qualities (primary qualities) without which one cannot conceive matter at all.

iv) Everything else that our senses tell us has to be explained in terms of these -- in terms, that is, of matter and motion.

v) GOD GIVEN LAWS.

3. That's the program -- explaining the full flux of experience in terms of behavior of neutral corpuscles -- that Descartes takes from Beeckman and works hard on for some years after 1618.

a) Results, or a sketch of them, are embodied in what was to have been his first published work, a book called Le monde, The World, which he had just about finished in 1633 when he heard of the condemnation of Galileo.

i) In Le monde, which is published after his death, he's placed the sun at the center of the solar system, and he therefore decides he had better not publish.

ii) Instead, he selects certain parts of his mechanical atomistic physics -- those without implications for the earth's motion -- and discusses them in extra detail in the first and third essays which the Discourse introduces.

iii) These are published in 1637 as samples of the results which the method can produce. They're exciting, for they include both a derivation of the law of refraction and a treatment of the rainbow far superior to anything that's been known before.

iv) Absolutely first class work.

4. I shan't give these detailed theories but take instead from Le monde the basic approach that underlies them.

a) Start with single corpuscle in void space. How does it move.

i) Straight line with constant speed. Principle of insufficient reason. This is Newton's first law, before Newton and a new law.

ii) But clearly particles don't continue to move in straight lines forever. Deflected by collisions.

iii) Thus next step is to determine laws of collisions. This is a new problem, inaugurated by Descartes and followed up by many others.

iv) It's an important source for Newton's Second and Third Laws.

b) For Descartes these are the only basic laws. They determine motion of matter through eternity.

i) In terms of them one should be able to analyse the entire flux of appearance.

ii) Not only motion of planets and projectiles, but also color, heat, smell, magnetism, and electricity, taste, and so on.

c) That's what he proceeds to do, and I shall shortly give you one example of what it's like.

i) But must first discuss one other step taken by Descartes -- a step in which he is not followed by many others but which proves terribly important to his philosophy and his method.

ii) ~~By an argument~~ For reasons that I'll come back to later, he squeezes the void out of the universe.

iii) More and more particles, less and less empty space.

iv) Thus virtual motions followed instantaneously by virtual collisions. "Tendency to motion" replaces motion, but is governed by same laws.

5. Now let me give you an example, in this case the Cartesian theory of light and vision, for it's got the greatest philosophical bearing.

a) Draw: Source (say a fire), jostling corpuscles.

i) Impulses transmitted particle to particle in straight line.

ii) To the eye. Thus eye is connected to fire by intervening corpuscles. It's push of these against the eye that stimulate vision. MAN WITH A STICK.

b) This is general notion, but there are many specifics.

i) Reflection by laws of impact.

ii) Refraction by change of speed at interface. New law that checks with experiment.

iii) Above all, a theory of color. White from tendency to linear motion, color if simultaneous tendency to spin.

c) From here Descartes goes on to other sorts of phenomena: heat as vibratory, tastes and smells in terms of corpuscular shapes, and so on.

i) I shan't now carry the mechanical physics any further, for you need only an overview of its thrust and structure. See what he's trying to do.

ii) But should say before leaving it that it is this aspect of his work rather than either his mathematics or his philosophy that exerts the greatest influence in 17th century.

iii) Most of the details turn out wrong, but many scientists, including Newton, start out from Descartes and try to make these atomistic mechanisms work better.

iv) Their model for physics is Descartes' model, and their success depends on his work in immensely significant ways.

## II. ATOMISM AND DESCARTES' METHOD

1. My concern at the moment, however, is not with the history of science but with that of philosophy.

   a) I therefore ask how this view of an atomistic-mechanistic physics affects both Descartes' own philosophy and that of seventeenth-century philosophy in general.

      i) In the process come back first to question posed at ~~end of last~~ starting this lecture -- why does Descartes think method of analytic geometry will work.

      ~~ii) This will lead to some remarks on what Descartes takes the method to be.~~

      ii) And from that point ~~finally to~~ I'll return the question I raised at the very beginning of my last lecture, an outline of the sense in which the Discourse marks the beginning of a major shift in the concerns of philosophers, from method in the narrow sense of rules of research to the more general problem of epistemology -- how can there be knowledge?

      iii) Finally, and briefly, what does Descartes take method to be.

2. The answer to the first question is, I think, quite easy though it's by no means generally accepted.

   a) If matter is qualitatively neutral, if it possesses only size, shape, position, then it can be exhaustively described by the techniques of geometry and algebra.

i) But all other appearances derive from neutral matter and motion, so that colors, tastes, smells, and all other appearances must also be reducible to geometry and algebra.

ii) In the early unpublished work on method that I mentioned ~~in my last lecture~~ earlier, there are some fascinating and tantalizing sketches in which Descartes tries to illustrate how colors might be handled geometrically and then submitted to algebraic analysis.

iii) ~~For~~ If that can be done, then the problems about them can surely be solved. And the representation should, on Descartes's view, be possible.

iv) Descartes' analytic geometry reduces all such problems to simultaneous equations which can be routinely manipulated. Everything else will follow.

b) That is, I'm quite sure, what lies behind Descartes' dream of a Universal Mathematics applicable to all the sciences. It is what makes it plausible.

i) I need not tell you that it didn't work for him or for anyone else in the seventeenth century.

ii) But may need to remind you that as a vision of what science might be like it has since come close to realization in a number of areas.

iii) During the 19th century light, heat, electricity, magnetism, and parts of chemistry do become subject to detailed mathematical treatment and are reduced to matter in motion.

iv) Descartes is not merely mad.

3. But if Descartes is not mad, he is in trouble.

a) This whole mode of posing the question raises a fundamental difficulty which is new to philosophy or to that part of it which has taken scientific knowledge seriously.

b) In scientific philosophy from antiquity through the Middle Ages, the main Aristotelian tradition that all perceived qualities were in some sense in the object.

i) Cut a triangle out of iron and heat it red hot.

ii) Then redness, and hotness, are just as much real qualities of the object as triangularity.

iii) Colors, tastes, and smell are on a partwith the geometric qualities. There's no priority for the latter.

c) Thus all the qualities, everything from which one draws scientific conclusions, are accessible to direct inspection.

i) Of course the senses can be mislead, and it's not always easy to tell when they are reliable.

ii) But that problem's not totally unmanageable, and when it's managed the information provided about external bodies by the senses is about what they really are -- hot, colored, as well as shaped.

d) In Descartes' philosophy, and in any other versions of the atomistic world view which dominates all later 17th-century thought, the situa-

tion is entirely different, and different in principle.

i) It's bad enough trying to diagnose shape of atoms so small one can't see them, but at least the shapes are really there.

ii) But the other qualities, the colors and sonon, aren't. They're not parts of the external world, not there at all.

iii) Instead, they're put in by the mind, in the mind. They are modes of incorporeal mental substance, and are not to be attributed to the world at all.

iv) They are, if you will, responses to external stimuli, but there is no longer any resemblance between the stimulus and the perception it produces.

e) Bridging that gap is the problem that the progress of science in the seventeenth century presents to subsequent philosophy.

i) It's new, and it creates, I think, the characteristic modern concern with the problems of epistemology, with the question how there can be knowledge at all.

ii) Bϕ far as I can tell Descartes is the first man to see them even dimly.

iii) By the time of Locke and Berkeley, later in the 17th century, they're fully explicit, and they have remained so ever since.

f) If I read the Discourse correctly, it's these problems rather than the traditional ones of how to draw sound conclusions that are its main concerns. No longer a method but a Th. of knowl. Ans epistemology.

## III. DESCARTES' EPISTEMOLOGY

1. Just how early Descartes sees these problems is not at all clear, but almost certainly not until some time well into the 1620's, after he's developed large parts of his analytic geometry and atomistic physics.

   a) They are not to be seen at all in the early work on method which Descartes apparently dropped about 1628.

      i) On the other hand, they enter immediately in the Discourse and are still more explicit in the Meditations, Descartes' next major work which is completed in 1640.

      ii) And, of course, the point at which they enter is in Descartes' program of methodological doubt -- reject everything that one cannot see to be clearly and distinctly necessary.

      iii) Build back from these clear and distinct elements to a program which will permit a mechanistic, atomistic physics.

2. How to build back, is, of course, the subject of your reading, and I'LL leave that presentation principally to you.

   a) But I do want to sketch what I take to be the main lines of the answer, for I think the Discourse has quite often been badly misunderstood.

      i) The principal source of misunderstanding, being that it's most often read by people who pay no attention to Descartes' work in physics and mathematics.

      ii) Miss the point that he's trying to justify science he's already got. a vicious process.

ii) Though the Discourse itself has been translated and published again and again, the edition in which you read it provides the first ever translation into English of two of the three scientific essays which it introduced.

iii) I hope you'll have a look at them, for the Discourse cannot be understood in the sense Descartes meant it unless seen as an appropriate introduction to these substantive works.

3. How then does the argument go? More precisely, how does it go if the brief Discourse is here and there supplemented by the fuller argument in the Meditations which Descartes publishes immediately afterwards?

a) First two steps are clear in your reading.

i) Because I cannot even doubt without thinking, there must be something which thinks. That is I. First indubitable knowledge.

(D. mean it. Not a fake.)

ii) But there must also be God, or I could have no idea of an entity more perfect than I. This is the second bit of knowledge.

b) So far we have made no use of the sense, but we can go no further without at least opening our eyes.

i) Justification for that step is not explicit in the Discourse, but is spelled out in the Meditations.

ii) Because God is infinitely good, he would not allow me to be systematically mislead if I restricted my conclusions from observation to its clear and distinct content. Essential to whole argument.

c) But if I may trust them that far, then the merest glance at my body and the world around demands that I admit the existence of matter.

   i) This is the other sort of fundamental stuff, extended substance, contrasted with mind stuff or soul, which has no extension.

d) But from this follows the key step which leads back to the physics Descartes has already built.

   i) If I ask what is matter? What properties of it do I know with total indubitability? Then answer must be, it's extension.

   ii) Dimensionality, the possession of extension, is the only clear and distinct characteristic of matter.

   iii) Void, extension without matter, is for Descartes a contradiction in terms. That's why he's eliminated it from his physics.

e) But if matter is simply extention, then it can be exhaustively treated, as we've seen, by geometry and algebra.

   i) Minimal amounts of everyday observation will give us laws of motion and collision.

   ii) Larger amounts of more careful experimentation will tell us, for example, which of the particular sorts of motion correspond to light and give us sensations corresponding to the various colors.

f) From there I ask you to go on by yourselves.

Close with single comments

4. Is this the right answer to the problem of how we can know.

   a) Of course not, though it probably comes closer than the pure rationalist answer usually attributed to Descartes.

      i) On that version, one would have no need for the senses at all.

   b) But, as I suggested at the very start of my first lecture, one reads the Discourse for its questions rather than for its answers.

      i) They are to a considerable extent new questions.

      ii) They've been with philosophy ever since.

      iii) To say that Descartes didn't get the answer right is not to distinguish him from any of the later figures who worked on the problems he raised.