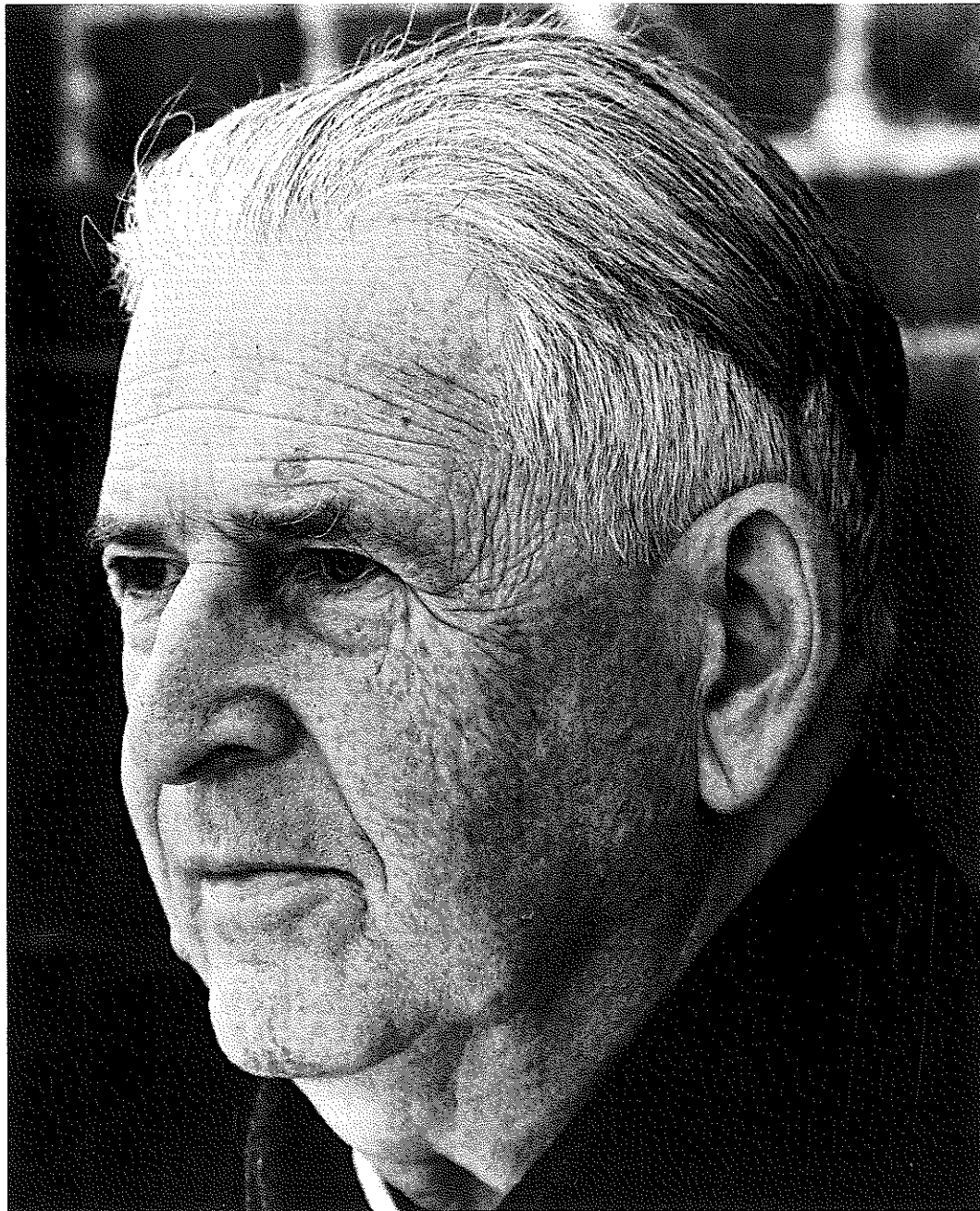


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I should like to thank Douglas Barton for reading proof and for helping put together the lecture on "The Copernican Revolution."—L.R.

Cover and end photographs by Charles Post '74.



The Art of Questioning and The Liberal Arts

by Jacob Klein

1. I propose to talk about what questioning means, what it entails, what it presupposes. Let me state from the outset that I could have said as well that I propose to talk about thinking. For thinking and questioning are inseparable. To raise a question means to be engaged in thinking. And to keep on thinking means to try to find answers to questions. If we ever reach a state of knowledge, we are in possession of the right answer to a question or a series of questions. And if there is such a thing as an assimilation of a body of knowledge without previous questioning—something we are all familiar with from our early school days—this thing has very little to do with learning and even less with thinking.

2. It is necessary, I think, to distinguish different kinds of questions, better perhaps, different kinds of questioning attitudes. I have to give you a number of examples to characterize the various kinds of questions. ① I may need a pencil. I may ask anyone of you: do you have a pencil? or: can you give me a pencil? A question of this kind is raised with a view to an action. I am, strictly speaking, not interested in knowing whether you have a pencil at hand or not. All I am interested in is to have a pencil in my own hand which I could use to write something down. Or I may wonder whether it will rain today, the question itself being whether I should

have an umbrella or a raincoat or whatever else could protect me from the rain or whether I should not do so, because I have to go somewhere for a definite purpose. Here again, I am only interested in something that I have to *do*: my interest concerns an action and the means I have to use to carry it out. Questions of this kind are, as we say, *practical* questions. And most of our questions are of this kind. ② Another kind of questions is of a very different nature. I meet an old acquaintance whom I have not seen and have not heard of for many years. I inquire: what have you done all these years? How many children do you have now? Or: what are you doing now? How is your wife? I may or may not be genuinely interested to know the answers. If I am not genuinely interested, these questions can be called *polite* questions. If I am, they may be characterized as *affectionate* questions. In the first case, they are not really questions, but rather manifestations of my desire to show some interest which I actually do not have. In the second case, the questions, although genuine, reflect not so much an interest in the answers as in the person to whom they are put. I may mention in this connection another kind of questions which are really not questions at all, the so-called *rhetorical* questions, that is, questions which anticipate the answer as an obvious one: for example, And who voted against this bill in Congress? it being understood that the obvious answer is: the Democrats, or the Republicans, depending on the audience to which the question is put.

① and ② have this in common, that the answer is *in itself* not important to the questioner. But then again there are

A lecture given at St. John's College, Annapolis, Md., on Oct. 5, 1956
Brackets [] indicate a word inserted by the editors.

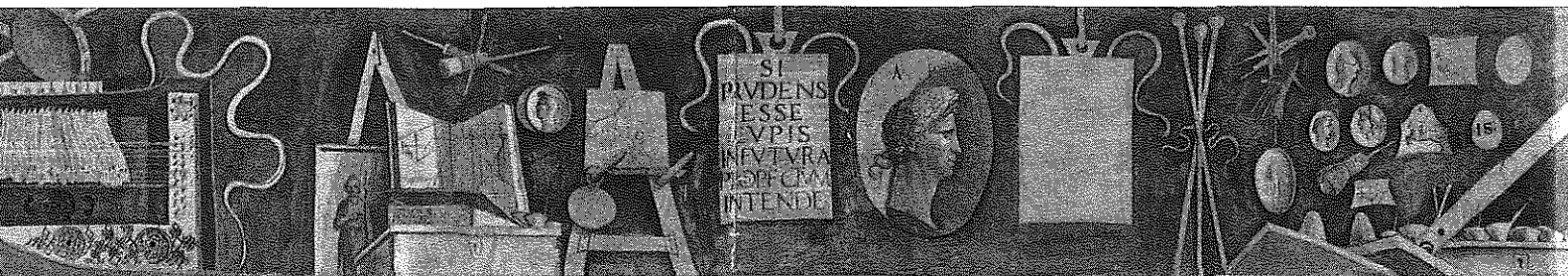


questions of a very different kind. © You might hear somebody ask: what did Mr. X say to Mr. Y? Or: what kind of dress did Mrs. Z wear last Wednesday? The questioner may indeed be genuinely interested in the answer, and yet it is clear that the answer merely satisfies a desire of the questioner to add some fuel to his malice or to his grudge or to his vanity or to his envy. The answer may also satisfy something in him that may be called "idle curiosity". He may traverse a street and suddenly notice that some house has been altered in some peculiar way, which observation may lead him to wonder: How come that Mr. Z, the owner of the house, decided to do that? It is of no importance to the questioner one way or another, and yet he is interested in knowing. All such questions can be characterized as *gossipy* questions. But it is worth while to stop here for a moment and to reflect upon the nature of "idle curiosity", a curiosity, that is, not guided by malice or similar feelings or passions. All gossip has an element of curiosity in it, of wonderment, and that means some quest, however infinitesimal, however distorted, for knowledge. If we use the metaphor "body of knowledge", we may perhaps say, paraphrasing Winston Churchill, that gossip constitutes the underbelly of knowledge. And it may even reach far nobler parts of this body if it is channeled in a certain direction. One may say that gossip is the small tribute that our passionate and appetitive life pays—in very, very small coins—to intellectual life.

© And this brings me to still another kind of questions. We might wonder: what is beyond that formidable mountain range? We question other people, who might know, about what is over there, what sort of vegetation, what animals, who the inhabitants are, what they do. We raise these questions because we are curious to know and for no other reason. Odysseus in his journeys constantly displays this kind of curiosity, which we may call idle, but which seems to deserve a better name. In a trial, where crucial facts have to be established, in our travels, where we meet with unfamiliar customs, we ask questions in order to win certainty about things, situations, people and their characters and so forth. Such questions could be properly called *exploratory* questions. And in raising such questions we want to know, either in order to base a judgment on the knowledge obtained or just simply in order to know. It must be granted that it is not always easy to draw the line between "idle curiosity" and a nobler sort of curiosity.

3. However different these kinds of questions, they have something in common. They are all confined within the

horizon of our daily lives, which includes the familiar and the surprising, routine and novelty, that which has precedents and that which has not. The usual and the unusual are labels put on things and events within the frame of our common experience. The unexpected is still within the frame of the expected. And it is this frame of the fundamentally familiar that actually allows [us] to formulate our questions. That is: they can be put in words. We are guided in our questioning by language itself, which is oriented towards the world around us, as we know it, including those parts or elements or factors that in some way remain hidden to us. There are usually some dark corners behind or in back of pieces of furniture in a room full of light. The world is full of such dark corners. Questions of the kind I mentioned before are like flashlights the beam of which we direct towards these dark corners. This beam is our language. And it is not too difficult to see that the articulations of language correspond to the various ways of questioning which we address to ourselves and to others as beings having a primordial although not always habitable home, namely the world. For being in a world is the most elementary and the most crucial character of our existence. Aristotle was if not the first then perhaps the most careful to analyze the articulation of language and thereby to indicate the various modes of our being in a world. He looks at the various ways in which we speak about things, in which we say something about something, and calls these various ways "categories" (*κατηγορίαι*). (The word means colloquially accusation, accusation in a court, in a public assembly. For example, this man stole my horse. More generally [and certainly in Aristotle] it means the way in which we say [not casually, but seriously, willing to defend what we say] something about something, in which we *predicate* something of something.) And in each case the mode of our speaking, predicating, is an answer to a question. The categories are in fact the various *kinds* of questions that can be asked to which corresponding *kinds* of answers can be given. First of all, we ask: *what* is this, or what is an electronic computer, or what is the North Pole? We also ask: *how many* people are present? Or: *what size* is this room? We also ask: *how* is this car—gray, powerful? How is this man—kind, violent, lazy? We also ask: what is the *relation* of this to that, of this man to that man? of this tree to that telephone pole? We also ask: *where* is he? and also: *when* will he be here? or when did this happen? We ask: in *what state* or *condition* is he—awake, sleeping, resting, breathing? We ask: what does he or it *do* (or did do or will do or might do)? He cuts wood; or she was preparing a meal; or



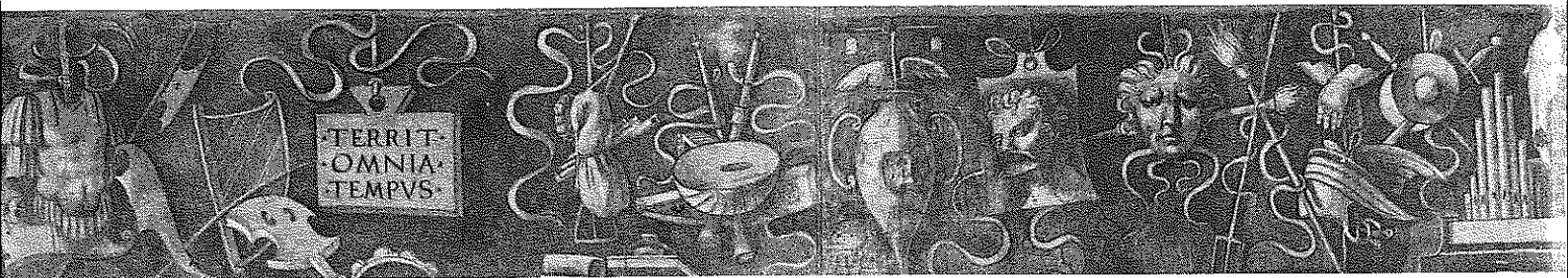
the hurricane might smash this tree. We ask: what did he *suffer*? he was beaten by Mr. Smith, he was told to go to a movie. In each case we can easily discern that the question (as well as the answer) requires a kind of word or word form to which a specific grammatical form can be attached. To the question *what?* corresponds a *noun*. To the question *how many?* a *numeral*. To the question *how?* an *adjective*. To the question *what relation?* a *genitive* or *dative* or a *preposition*. To the question *in what state?* an *intransitive verb* or a *participle*. To the questions *where?* and *when?* *adverbs*; to the question: *what did it do?* and so forth, a *transitive verb* in the *active voice* and the *indicative, subjunctive or optative* mood; to the question *what did it suffer?* the *passive voice*. And beyond that questions and corresponding answers require the building together or separating of words, that is, *conjunctions*. All our speaking and conversing with each other, making statements, declaring, proclaiming, lecturing, is a web of questions and answers, even if the questions can sometimes [be] the answers, be tacit or inexplicit. And it is important to note—in our context—that the very possibility of our questioning depends on the grammatical structure of our language and correspondingly the grammatical structure of the world around us.

Does this mean that we could not raise questions unless we knew some grammar? Or are we in the position of one of the characters in a Molière play who, not having heard of the term “prose” before, is surprised to learn that he has actually always been speaking in prose. I think we are. Our speech, and that means our questioning and that means our thinking, is grammatically structured even if we never studied grammar. That is, it can be, and so often is, faulty and *artless*. The art and science of grammar has its origin in our becoming aware of the pitfalls in our speech. This becoming aware means that we begin to *reflect* on what goes on when we speak. And I shall have to say more about this reflecting a little later on. The discovery of rules and canons and patterns in our speech converts or at least may convert our questioning from an artless one into an artful one. To give you perhaps the most impressive and most significant example of this, let me tell you or remind you that the first and foremost question of Socrates is: *what* is this or that (justice, virtue, courage, but also tragedy, comedy, and also star, man, dog, stone): *τί ἐστὶν* . . . and some of you have seen and some of you will see how far such a question leads. But the discovery of rules and canons and patterns in our speech leads also to the establishment of the art of grammar itself which, pursued for its own sake,

Giorgione, *Frieze with Attributes of the Liberal and Mechanical Arts*, Castelfranco, Veneto, about 1500.

becomes the liberal art of Grammar. And most important, with this discovery the horizon of our daily lives recedes: a new domain, a new dimension of our lives comes to the fore. And with it a new possibility, a new kind of questioning, quite distinct from the one I mentioned before. But before I enlarge upon this point let us look at another aspect of the phenomenon of questioning.

4. I am permitted at this point to ask the question, What is a question? Let me try to answer: it is a state of mind in which I want to know what I do not know. But then what is the condition of my knowing or my thinking (rightly or mistakenly) that I know? I shall try to answer: it is my ability to locate that which I do not know within a *greater whole* that I do know or, note please, do not know. I come to a city for the first time. There are houses and streets and bridges in a confusing array. I feel lost. I want to know where I am, where the street corner I happen to find myself is. I look at a map. After some searching I establish where I am in relation to the whole city on the map. I have found an answer to my question. I do not know the city, and yet I have now some tiny bit of knowledge concerning that street corner I am on. Taking my clue from this example, I can say: A question is not merely a state of mind in which I want to know what I do not know, but it is one in which I also anticipate that there is a greater whole, in which that which I want to know is located or of which it is a part. In my questioning then, I am always anticipating a greater whole, which ultimately means that the simplest question supposes a hierarchy of wholes ☉. That's why any classification is an answer to a question or a series of questions. And that's why all thinking always implies a connecting of particulars to universals. And that in turn means that our questioning depends on *logical* relationships which are always relationships between particulars and universals. Does this mean that we cannot raise questions unless we know some logic (Mr. Jourdain in Molière again)? No, the logical relationships are within our thinking, whether we are aware of it or not. But being aware of it may actually help us to avoid mistakes. Here again the reflection on what goes on in our reasonable speaking as far as the discovery of rules, canons, and patterns in the relationship of particulars and universals that guide our *inferences* leads to the establishment of the art and science of Logic. And the art and science of logic, pursued for its own sake, that is, liberally, makes it



possible for us to transcend the horizon within which we live.

We have yet to consider another aspect of the phenomenon of questioning.*

5. I have said three times that some reflection on what we are doing in speaking, thinking and questioning must precede the establishment of the liberal arts of Grammar, Logic, Rhetoric (Trivium). Now I have to take up this theme of reflection, to reflect upon it. In all the kinds of questioning I put on the board, we stay within the confines of our daily horizon. But it is within our capacity as questioning beings to adopt a questioning attitude of a totally different kind.

I said before that within the confines of our horizon, there is the expected as well as the unexpected, the old and the new, the known and the unknown, the familiar and the unfamiliar. We do, however, experience a kind of question which, as it were, tends to smash those bounds which limit us. We do occasionally, and I trust you know what I am speaking about, stop altogether and face the familiar as if for the first time. Anything: a person, a street, the sky, a fly. The overwhelming impression on such occasions is the *strangeness* of the thing we contemplate. This state of mind requires *detachment*, and I am not at all certain whether we can contrive its presence. We suddenly do not feel at home in this world of ours. We take a deep look at things, at people, at words, with eyes blind to the familiar. We reflect. Plato has a word for it: *μεταστροφή* or *περιαγωγή*, a turnabout, a conversion. We detach ourselves from all that is familiar to us, we change the direction of our inquiry, we do not "explore the unknown" anymore. On the contrary, we convert the known into the unknown. We wonder. And we burst out with that inexorable question: why is that so?

This "why" seems to have its roots in those other worldly questions. Obviously, I can ask, why did it rain yesterday and does not rain today? Why did Mr. X say this or that to Mr. Y? And this "why" I am talking about now is itself of a different kind. It seems not to assign causes to the existence of things or to events, but rather to find *reasons* for the being of things as they are, among other things for our language and questioning being guided by rules of Grammar, Logic and Rhetoric. It seems (again in the phrase of Plato) to account for what is the way it is—*λόγον διδόναι*. And that's how the arts and sciences of the Trivium become established. We may begin to understand that our simple and common-day ques-

tioning ultimately depends of these primordial sciences and *not* the other way around. Even our gossiping may ultimately rest on the transcendent power of this "why". (Even the children's "why", repeated endlessly, to the disgust of their mothers and fathers, may ultimately derive from the human possibility of a total conversion.)

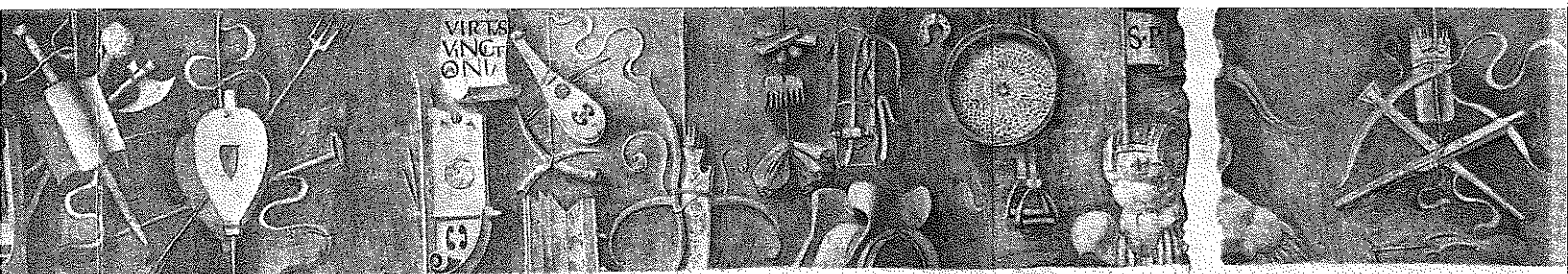
Can I give other examples of answers to *this* kind of why? (Other, I mean, than the arts of the Trivium.) I think I can. I shall try to indicate three of such possible answers.

(A) I gave you the example of the man who wants to find out where he is in a city that is totally unfamiliar to him. He has recourse to a *map*. Please reflect [on] what sort of thing a map is (or a blueprint). There is nothing on a map of a city remotely resembling the city it is supposed to represent. In fact, the detachment needed to conceive that a multitude of lines on a piece of paper represents a city requires an immense intellectual effort on our part, an effort of detachment from the familiar, which is difficult to understand, very difficult indeed, once you try to look at a map with unfamiliar eyes. A map is one possible result of detaching ourselves from the usual and the familiar. Note please that the detachment which is at the base of the conception of a map is not to be confused with the fact that maps are familiar things for most of us. Imagine now that we try to answer the question: why are things, all things, the way they are, by giving a map of the world. I do not mean of course an astronomical map including all galaxies. I mean to project in a certain order, according to certain rules, all that we are more or less familiar with, living and inanimate things, vices and virtues, passions and sciences, monsters and trivia, onto something resembling a geographical map. It would contain all relationships (not spatial ones) that bind everything together and separate some from some. Such a map is something called a philosophical system—and sometimes a poem and sometimes a novel. (And if it is not such a map we might as well disregard it.)

(B) We have seen before that even the simplest question presupposes a hierarchy of wholes. We may justly wonder at that. How can there be *many* wholes? We may reach in the state of *μεταστροφή* the idea of the one whole, not lacking anything, which we may variously call The One, or God, or the Idea of the Good, as Plato did.

(C) In answering the question *how many* and *what size*, we can reflect on the strangeness of this question itself and what it presupposes. We may (just as in the case of the Trivium) raise the question about the intrinsic possibility of these questions: how many and what size. We would reflect about the

* A section on Rhetoric is missing from the manuscript at this point.



nature of numbers and of spatial arrangements. And we include the contemplation of motion in relation to numbers and spatial arrangements. We should establish the liberal mathematical arts, which would give us an ultimate account of why things are as they are. Such procedure is the way of science (Arithmetic, Geometry, Music, Astronomy—today, mathematical physics).

To preserve the detachment in all these three cases is not at all easy. Not in the sense that it is perhaps difficult to remain for any length of time on the top of the Himalayas, in the profound pit of a coal mine. The reason seems to be the ambiguity of the *why*? It is one thing to pursue the exploring within the confines of our horizons, another to detach oneself from them. And yet the confusion necessarily arises. In all these cases we begin to interpret the ultimate answer in terms of our worldly experience.

We tend to understand a philosophical system, a poem or a novel as a mere extension of our horizon. We say it enriches

our lives. If it does, we run the risk of misunderstanding it.

We tend to reduce the One, or God, or the Idea of the Good to the level of our gossip curiosity.

We tend to interpret our scientific insights as a re-statement of our daily experiences, [a] confusion of exploration with this different “why?”—not only [a] confusion, but [one which is] essential to science.

I can't help ending all this by inviting you to look at this strange word: *responsibility*. It obviously implies *response*, that is, answer. Answer to what question? I think it is the answer and the proper reaction to the nature of questioning itself. For who or what is it that does the questioning? Man? But Man facing himself and the world. His very existence raises these questions. They may be of very different kinds, as we hope we have seen. Responsibility seems to me to demand from us an effort not to confuse the nature of the questions. We have to answer on all levels. Not to confuse these levels seems to be the life of a responsible man.

The Copernican Revolution

by Jacob Klein

This is an historical lecture. And that means that it will hardly be convincing and the best it can do is to raise in you some questions and to make you try to answer these questions and perhaps to read some books. And in this sense, it may be useful; otherwise, it is not.¹

Copernicus' book, *On the Revolutions of the Celestial Spheres* appeared in 1543. That was the year he died. He had no way of supervising the publishing. When the book first appeared, and even in later editions, the text was full of misprints. Hardly a number is correct. Now the main significance of the book is, as you know, that it tells that the earth, our earth, is one of the planets moving around the sun and, in addition, rotates daily on its own axis. Furthermore, as you all know, I am sure, there is a third motion, and we'll talk about that a little later. This theory, let me use this modern word, this theory was in itself nothing new, and Copernicus insisted on its not being new. A number of people in antiquity and later on, especially in the 14th and 15th centuries, had envisioned the possibility of a daily rotation of the earth, in antiquity Heracleides of Pontus, in the 14th century Nicolaus Oresmus and in the 15th century Nicolaus of Cusa. But, above all, Aristarchus of Samos, around 275 B.C., had a heliocentric system. We know that from Archimedes. Also there were more or less legendary Pythagoreans who thought of the revolution of the earth in an orbit around the center of the universe. And all the consequences or, rather, the necessary assumptions connected with this theory were certainly known in antiquity. The Copernican astronomical theory is in itself no revolution. It gained its revolutionary character through the interpretation it was subject to and through the immediate, far-reaching conclusions drawn from it and, I hasten to add, latent in it. By the way, you know the title of

the book is *On the Revolution of the Celestial Spheres*, and our word "revolution" [as used in reference to certain historical events] is indirectly related to this title.

Now the Ptolemaic theory and all classical ancient theories, like those of Eudoxus and Hipparchus, are based on a mathematical-physical postulate, which can be formulated as follows: all motions of celestial bodies must be deducible from, or reducible to, regular, that is, uniform motions on circles.

You probably know that in the 17th century a law was formulated by Newton and others, which is called the law of inertia. You know about it, I think, because you heard about it in school. This law of inertia says that a body, if nothing troubles it, continues in its motion uniformly in a straight line. When I was about 16 or 17, I thought that was perfectly self-evident. Well, it is far from being self-evident. It is not even true. One of the great difficulties in this law is the notion of a straight line. You will all remember the fourth definition of the first book of Euclid where the straight line is defined and that the definition is not quite clear.

Now the postulate I just enunciated, that the motion of celestial bodies must be deducible from or reducible to uniform motions in circles, can be called the classical law of inertia. That's how bodies behave. That's what this postulate says. It is implied in this postulate that the motion in the circle is uniform about the center of the circle. The tradition attributes this postulate, and the attribution may or may not be true, to Plato. A late commentator on Aristotle, Simplicius, quotes other commentators such as Sosigenes and Eudemos to the effect that Plato posed a certain problem out of which classical astronomy arose:

What are the uniform and orderly movements, the assumption of which permits to save the appearances in the movements of the planets?

The phrase "save the appearances" seems very simple. It isn't so very simple. To be cautious, it is pretty certain that Simplicius understood that in an Aristotelian way. That means that, given a certain phenomenon that is not quite understandable, you have to make certain assumptions so that from these assumptions you can make the phenomenon un-

1. For many years Jacob Klein gave a yearly talk on Copernicus. He spoke from notes without a written text. The following text is pieced together from transcriptions and tapes of three of these talks. I have made minor changes throughout and bracketed them only in instances where they were important enough to need notice. In several instances I have omitted sentences, for the most part, asides to the audience. Winfree Smith edited the first section (until the asterisks). For the sake of clarity he slightly expanded the sections accompanying the three diagrams. I should like to thank him for his help and the instruction that necessarily came with it, given as always unstintingly. L.R.

derstandable, intelligible, rational. By doing that you save the phenomenon as phenomenon. That is, if a certain planet makes strange motions in the heavens which are observed as strange and you don't quite understand what they mean, then if you introduce certain assumptions or, as the classical term is, certain hypotheses, then these hypotheses will make you understand what goes on in the motion of the body and will save the appearances. It is not certain that Plato ever formulated this problem the way it is reported, i.e., whether he meant it the way Simplicius and the entire tradition, and certainly Ptolemy, meant it.

So what we have is that the fundamental hypotheses are necessary. These are made in Ptolemy. They include, for instance, circles called deferent circles because the centers of other circles called epicycles are traveling on them, the motions of planets on the epicycles and of the epicycles' centers on the deferents being uniform. Furthermore, I am sure you remember, Ptolemy proves the total equivalence of the epicyclic and eccentric hypotheses, the eccentric hypothesis being that something moves on a circle the center of which is not the earth's center. Now this is one way in which Ptolemy deviates from the fundamental postulate. He assumes the equant. You all remember the equant, right? He assumes that a body can move on a circle while its motion is uniform about a point that is not the center of the circle. That is not what the classical postulate demands. Ptolemy is quite aware of all the difficulties his view presents. He apologizes for them. In Book IX of the *Almagest*, Chapter 2, he says:

We are compelled by the very subject we are dealing with to use devices that go against reason, as for instance, when for the sake of convenience we carry out demonstrations on simple circles described by the movement of the planets in their spheres and supposed to lie in the plane of the ecliptic. We are also compelled to lay down some fundamental hypotheses, starting not directly from an appearance, but conceiving them after a continuous series of trial and adjustment. (This seems to refer to finding the center of the equant.) We are, moreover, compelled to assume for all the planets not one and the same kind of motion and, as to their circles, not one and the same kind of inclinations. We agree to do all that because we know that the use of those devices does not lead to any appreciable difference in the results and, consequently, does not impair in any way the solution of our problems; and also because we know that the hypotheses arrived at in a way that cannot be strictly demonstrated, once they are found to agree with the appearances, could not have been arrived at without some methodical thinking, though it is hard to describe how they are got hold of, which is not surprising since universally the fundamental principles have either no cause at all or one that by its nature can hardly be grasped; and also because we know that as far as the hypotheses of circular motion are concerned their diversity cannot be considered

strange or unreasonable, since the appearances of the planets themselves are found to be different for every planet; provided that we save in qualifying in all cases the regular motion in circles and give a demonstrative account of each of the appearances according to a higher and more universal similitude in all the hypotheses.

Now let's turn to Copernicus and remind ourselves of what Copernicus does. First of all, Copernicus is much more Ptolemaic than Ptolemy. That happens very often in the history of human thought. He rejects the equant. There can be no equant. Then, in addition to the rotation of the earth and its revolution about the sun, he assigns to the earth a third motion. For he supposes that without this third motion the

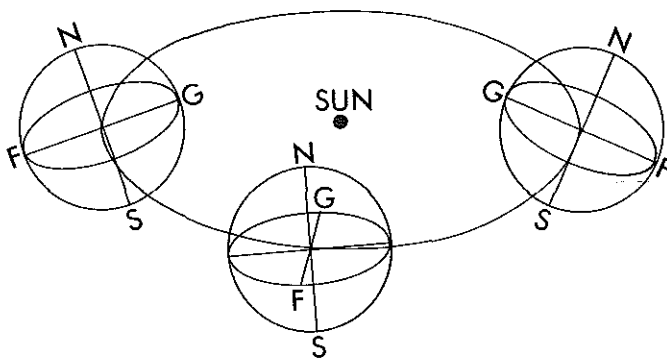


Figure 1

axis of the earth would not during a single revolution about the sun point to the same place in the sky, whereas in fact it always points to a place very near the "pole" star. The picture we would get would be like this (Figure 1). Why does Copernicus suppose that? Because he still thinks of a moving epicycle. He thinks of the equator of the earth as an epicycle with aphelion F and perihelion G. So he has to introduce a third motion; namely, such a motion of the axis that in a wonderful way describes a double cone in a little less time than it takes for the earth to complete its revolution about the sun in relation to the fixed stars.² Just by making the time a little less, Copernicus accounts for the great phenomenon of the precession of the equinoxes.

Now let us compare the way Copernicus explains the motion of an outer planet, for example, Mars with Ptolemy's explanation. Figure 2 exhibits this very well. What this figure shows is the superimposition of the Copernican view on the Ptolemaic view. For Ptolemy the earth is at E. The center of the deferent is D and the center of the equant is Q. Then

2. For the double cone see figure XXV in *Ptolemy and Copernicus, Theory of the Planets* (St. John's Press).

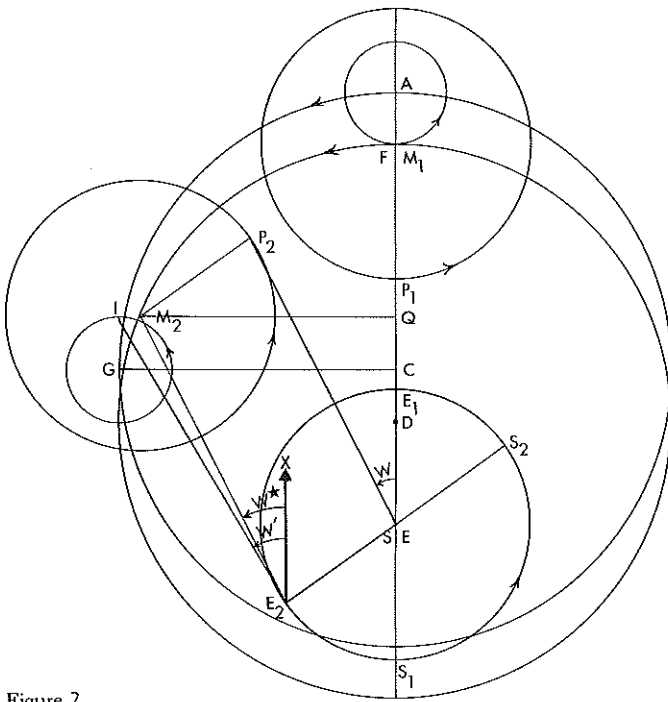


Figure 2

there is an epicycle with center M_1 that moves around the deferent. This Ptolemaic figure takes care of both the so-called heliacal anomaly and the zodiacal anomaly. But there is that villain, the center of the equant, the point Q . It is only in reference to Q that the motion of M_1 on the deferent is regular. Now, if we take Copernicus' view, then, first of all, we replace the earth at E with S , the sun; and the earth moves, right?, the earth moves. It moves in the circle $E_1 E_2 S_1 S_2$. In the Ptolemaic diagram M_1 , the center of the epicycle, is the mean planet, while the planet itself is moving on the epicycle. Now Copernicus chooses as center for his deferent circle not D , and *certainly not* Q , but a point halfway between Q and D . That's point C . This is the center of Copernicus' deferent, which is a deferent because it bears an epicycle, the little circle with center A in the figure. This little circle is much smaller than it appears in the figure—this diagram doesn't reproduce the relative sizes of things but is really only the pattern in which the circles and their motions may be conceived. On this little epicycle the planet really moves. Now Copernicus might have substituted the planet for the Ptolemaic mean planet, the center of the Ptolemaic epicycle. Then he would have had a single circle for the planet's motion with center D , and if we take the positions E , P_1 , and M_1 as Ptolemaic starting positions for earth, planet, and mean planet and S , E_1 , and M_1 as Copernican starting positions for sun, earth, and planet, then with the Ptolemaic planet and mean planet, after a certain time, at P_2 and M_2 and W as the angle of observed motion we would have the Copernican earth and planet at E_2 and M_2 and W^* as the angle of observed motion. It is easily proved, as you must have done, that $W^* = W$. But then the planet would have its motion uniform about the equant point Q , a thing intolerable

for Copernicus. Copernicus, therefore, introduces the little epicycle with center at A .

Now, once more we assume the same Ptolemaic and Copernican starting positions. Only we suppose that Copernicus' position for the planet is on the little epicycle on which the planet is moving in a clockwise direction and with the same uniform angular velocity about A with which the center of that epicycle is moving on its deferent circle about the center C . Now, as you remember, the planet will not describe the circle which the mean planet describes in Ptolemy. For instance, the point I on the left does not coincide with the point M_2 . Moreover, the diagram here has two angles, W^* and W' . W^* , which equals W , is the angle of vision, or observed motion, in Ptolemy and W' is the angle of vision in Copernicus. These two are not quite the same, so that, if Ptolemy's angle agrees with the observations, Copernicus' does not. But the difference between the angles is very, very small, much smaller than the diagram shows, so small that it couldn't really be drawn in a diagram [or detected with any instruments that Ptolemy or Copernicus had]. Now, therefore, the planet does not describe, strictly speaking, a circle, but something which is very close to a circle, very close. [The dotted curve FGL in the diagram on page 742 of *On the Revolutions of the Celestial Spheres*.] And there is an eccentric deferent circle and an epicycle. Everything is totally Ptolemaic.

Now I have to say two things here. This diagram presupposes something very important which you all know; namely, it presupposes that the sphere of the fixed stars is at an immense distance from the system of the planets. Let's say that the earth is at E_1 in Copernicus and we on the earth look at the sky at a certain hour of night, perhaps in the direction of $E_1 F$. We see certain stars. Then the earth moves, let us say to the position E_2 . So it changes position. We again look at the sky and locate one of the stars we saw before. It is exactly where it was before in relation to the other stars. No parallax. Why? Why? Let's formulate it this way. The stars are so far away, so terribly far away, that it doesn't make any difference where our earth on this ridiculous little orbit is. No matter where E_2 is, the distance between $E_2 X$ and $E_1 F$, though it may be millions of miles, is as nothing compared with how far away the stars are. That's one thing.

The second thing has to do with Ptolemy's observations. You know that Ptolemy possesses the first of many kinds of observations. Certainly he himself made some observations; and these are on the whole very precise. The word "precise" is a very difficult word. By the way, they are very precise. And the margin of error is about ten minutes, ten minutes of arc.³ Ptolemy and those people whom he quotes could make measurements that were that close and, by the way, they had

3. It used to be thought that this was the Ptolemaic margin of error. But it is now generally agreed among those who have really studied the question that this is not so. Ptolemy must have made some observations with the instruments he describes; but, since it is known that some of what he reports as observations are not genuine observations, it is hard to tell which are genuine and which are not. One, therefore, cannot say anything with certainty in comparing Ptolemy and Copernicus as observers. J.W.S.

very simple instruments. But they had great patience. They could do this good measuring because the sky over the Mediterranean is clear and wonderful. But Copernicus sat somewhere in East Prussia and Poland where the sky is awful. Copernicus never could measure and observe anything well. And all the observations he made are certainly not within the Ptolemaic margin of error. And then Copernicus has the conviction that all observations preserved through the centuries from Hipparchus and Ptolemy on to his days were good. And, therefore, they must all be accounted for. And, therefore, incredible hypotheses must be made. And he accounts for all his observations, be they right or wrong. That doesn't matter. They must be accounted for. In his way Copernicus is an incredibly great artist.

Now, the thing is that when finally Copernicus decides that the Ptolemaic account is not right, he publishes this book, *On the Revolutions of the Celestial Spheres*; by the way, he worked on it for years and years and years, and there were pupils of his that helped him to work and one of the most important ones is a man whose name I am sure you have heard. His Latin name is Rheticus, his real name George Joachim, and before Copernicus published his book Rheticus published a first report (*Narratio Prima*) on it from which we learn many things. Now, for example, this is what Rheticus says about what Copernicus is doing:

My teacher was especially influenced by the realization that the chief cause of all the uncertainty in astronomy was that the masters of this science—no offense is intended to the divine Ptolemy, the father of astronomy—fashioned their theories and devices for correcting the motions of the heavenly bodies with too little regard for the rule which requires that the order and motions of the heavenly spheres agree in an absolute system.⁴

And Copernicus himself says:

Former astronomers have not been able to discover or to infer the thing which is chief of all, that is, the form of the world and the certain congruity, or symmetry, of its parts. But they are in exactly the same fix as someone taking from different places hands, feet, or head, and the other limbs, very fine of themselves, but not formed with reference to one body and having no correspondence with one another. So that such parts make up a monster and not a man.⁵

That is, he means that if you take together all the statements Ptolemy makes in the *Almagest* and, by the way, the tradition on which it was made, then you do not get an orderly world, a cosmos, but some monstrous construction.

4. From the *Narratio Prima* translated by Edward Rosen in *Three Copernican Treatises*, New York 1939, 138.

5. From Copernicus' Preface to *On the Revolutions of the Celestial Spheres*.

There is a book which is called *The Hypotheses of the Planets*. This book is attributed to Ptolemy. It is probably written by him, though some doubt is allowed. This book is to some extent an attempt to make the world, to see the world, as one body. But, while I am saying that, I must call to your attention that this is not necessarily the intention of this book. One can say only this much, that it tries to give a view of the solid body of heavenly motion; I mean, of the heavenly motion in three dimensions. Whether one can really connect the different planetary motions which are given by Ptolemy, namely, those of the Moon, Mercury, Venus, the Sun, Mars, Jupiter, and Saturn, to make one big body with spheres that fit into each other with solid rings or drums where the epicycles are located is a big question. It would certainly be a very difficult undertaking. Now that's what Rheticus criticizes, and he means that in Copernicus it is not this way.

In Copernicus we have one work; there is unity and congruity and simplicity. For instance, as Rheticus says, all irregularities in the motion of the earth and, by the way, there are quite a few (some that are truly irregularities and others based on faulty observations), all irregularities are determined by the motion on one tiny little circle. How many of you know this? Please raise your hands. How many know? That all irregularities in the motion of the earth on its orbit are due to the motion of a certain point on a tiny little circle. I know you know it because Mr. Winfree Smith told me that. Aha, we'll see, we'll see. Look at the diagram (Figure 3).

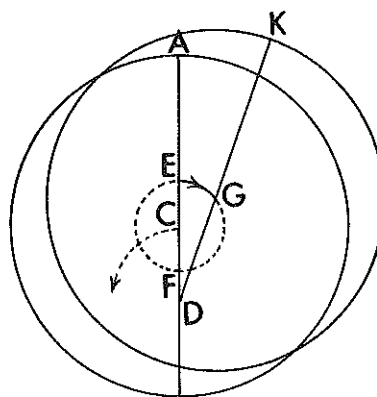


Figure 3

According to Copernicus, the earth has three regular motions, the daily rotation, the annual revolution, and the motion of the axis that makes the double cone. Of these the third motion is affected by two irregularities which can be thought of as librations of the poles, and the second, the annual revolution, is affected also by two, a change in eccentricity and a motion of the line of apsides, the line that joins aphelion and perihelion. Now look at the diagram (Figure 3). If you understand the earth as moving counterclockwise, eastward, on the circle that has G as center and make G revolve clockwise on a little circle, with center C, that does not enclose the sun, which is at D, then the eccentricity will change from maximum when G is at E to minimum when G is at F, and

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so on. This change constitutes, according to Rheticus, the wheel of fortune. Have you never heard of that? Surely you have heard of the wheel of fortune. That is the wheel of fortune. It determines all irregularities,⁶ including the motion of the apsides which it produces as the whole wheel with its center C moves regularly with the signs, eastward, 24 seconds annually. Now let me read what Rheticus has to say about the wheel of fortune. I am sure some of you have heard it. But it is good to hear it again. "I shall add a prediction." It is Rheticus who says that.

We see that all kingdoms have had their beginnings when the center of the eccentric was at some special point on that small circle. Thus, when the eccentricity of the sun was at its maximum, the Roman government became a monarchy; as the eccentricity decreased Rome too declined, as though aging, and then fell. When the eccentricity reached the boundary and quadrant of mean value, the Mohammedan faith was established; another great empire came into being and increased very rapidly, like the change in the eccentricity. A hundred years hence, when the eccentricity will be at its minimum (by the way, this is written in 1540), this empire, (the Mohammedan empire, the Turks), will complete its period. In our time it is at its pinnacle from which equally swiftly, God willing, it will fall with a mighty crash. (Now it is true that a hundred and forty years later the Turks were chased out of Europe.) We look forward to the coming of our Lord Jesus Christ when the center of the eccentric reaches the other boundary of mean value, for it was in that position at the creation of the world. This calculation does not differ much (not much, but somewhat) from the saying of Elijah, who prophesied under divine inspiration that the world would endure only six thousand years, during which time nearly two revolutions are completed. Thus it appears that this small circle is in very truth the Wheel of Fortune, by whose turning the kingdoms of the world have their beginnings and their vicissitudes. For in this manner are the most significant changes in the entire history of the world revealed, as though inscribed upon the circle.⁷

6. There is no obvious link between the irregular change in eccentricity and the irregular librations, which are crosswise to one another, of the poles of the earth. Of these librations (which, of course, have to be reduced to regular circular motions) one gives the change in the rate of the precession of the equinoxes and the other the change in the angle of obliquity of the ecliptic (the angle between the plane of the earth's equator and the plane of its orbit around the sun). Copernicus supposes (without giving sufficient reason) that the period for one complete cycle in the change of eccentricity (i.e. one complete motion of point C in circle EGF in figure 3) is 3434 years, the same period that he assigns (without reason) to the change in the obliquity of the ecliptic (*Narratio Prima*, 121) and which he claims (also without reason) is double the period of the change of rate of precession. That is what is meant by saying that "all irregularities are determined by the motion of one tiny little circle." J.W.S.

7. *Narratio Prima*, 121-122.

Why did I read that to you? I read it to you to show you that what goes on in this book, *On the Revolutions of the Celestial Spheres*, is more than astronomy. It implies certain things which regard the whole world and which concern us men here on our earth. That is how Rheticus understood it from the very beginning. And that's how I think we all should always understand anything that's presented to us as a theory.

Now let me continue with the report. The tendency to what is unity and simplicity is especially clear in the fact that the one orbit of the earth, and I will have to repeat it later, replaces five Ptolemaic circles, namely, three epicycles in the outer planets and two deferent circles in the inner planets. And this again is determined ultimately by the little circle, the small circle, the wheel of fortune.

* * * * *

What now does the Copernican system accomplish, simply and strictly, in terms of a mathematical description of the universe? It does unify the universe by means of the great circle of the orbit of the earth. It does give a greater unity to the whole thing because there are [in Ptolemy's conception] these whirling epicycles with their tremendous radii from which certain inconveniences arise, namely, if you take Venus' epicycle, which is much larger in that it is actually three quarters of the radius of the deferent circle, and if you note Venus at the perigee and Venus at the apogee, then it's clear that Venus ought to appear, I think, something like sixty times larger sometimes than at other times—which it never does. That's the case of the moon, too, but not very important there, because Ptolemy could have changed that also.

Then if I were to trace the path of the planet in Ptolemy, I would get an incredibly involved curve. I have a book in which anyone interested can see the path of Mars, for instance, in a period of approximately twenty years. It is a very beautiful curve with incredible loops and so on, but terribly complicated. If you trace the path of the Copernican planet, as you will remember, you will get in each case what he calls almost a circle, a quasi circle, so that although the planet itself does not move in a circle its motion is simply the result of certain circular motions. There is a certain unification and, in virtue of this, a greater simplicity.

Let us not forget that this greater simplicity is brought about at the expense of a fantastic complication with incredibly many irregularities. Also the sun, although being the center of the universe, has nothing to do with the whole thing. Each planet has its own center around which it moves and each center is at a different distance from the mean sun. And then the mean sun is at a certain distance from the big sun—and the big sun simply is and shines and does nothing else.

The question that is very much in my mind is this: why should anyone have accepted the Copernican hypothesis? And that is a terribly difficult question to answer because the physical arguments advanced by Ptolemy are simply not negligible. Any kind of proof and any kind of evidence for the plausibility of the Copernican system was not available for hundreds of years afterward. Further, certain great and really

important discoveries that were made following the publication of this book and which culminate in the discoveries of Galileo when he first looked at the sky through a telescope at no point could justify the acceptance of Copernican astronomy.

Now I must talk about these discoveries because they are essential to what I want to say. First, in the years between 1543, when the book appeared, and 1572, and then later in 1604, there were two incredible appearances in the heavens. Now such things occur often, not daily, but often. (You read about them in newspapers and magazines, although you don't pay too much attention to them.) These are called the appearances of a *nova*. Now a *nova* is a new star and that means that at a certain spot in the heavens where there was no star (not even through a telescope) suddenly a star appears—an unbelievable star, brighter than all the others. And it burns brightly for years and then declines and, after a certain time, disappears. This happened especially in 1572 and 1604.

Now of course these stars had appeared before, too, and people, since at that time they looked at the sky more carefully because there was not so much electric light from cities, being aware of the sky as sometimes we aren't, noticed this. The understanding of these phenomena was that they occurred within our own atmosphere—within, in Ptolemaic or Aristotelian terms, the sublunar sphere. Beyond this nothing could change. For if it could, such an appearance as a bright new star would indicate an incredible change up there in the divine intelligence. That could not be.

Now, when these phenomena occurred in the 16th century, Tycho Brahe, one of the greatest observers of all times, began immediately to calculate the possible distance away of these new bodies. He found that they could not be so close to the earth as people imagined, and his observations were impeccable.

You know there are certain difficulties the moon presents to all of us, including Ptolemy, since you can never observe it accurately because of the parallax. The position of the moon differs because of the position of the observer on earth. Now if a thing appears within the sublunar sphere, then the parallax would be very bothersome. But Brahe established by extensive travel and observation that these new bodies involved no parallax. Therefore, these bright objects could not be closer than the moon. He wrote a book about that; by the way, quite a few people did. It was a tremendous thing to find that there are changes beyond the moon.

The next thing is that a comet appeared. Now these, too, appear very often and these, too, had been understood to belong to the sublunar sphere. And Brahe again, by computations of a very ingenious kind, proved that this comet traversed the outer regions of the world. Moreover, if one observed it carefully, it was clear that it had to traverse other spheres—the spheres of Saturn, Jupiter and Mars, which at that time were supposed rigid, transparent but rigid. Let me mention that there is nothing particularly dumb or archaic about that because, even until 1905, the ether, in which all the electromagnetic motions were supposed to take place, was considered to be a rigid body—mathematically necessarily so.

But certainly comets could not pierce this rigidity and, if they did, obviously these spheres could not exist. Therefore, Tycho Brahe did one very important thing, quite apart from Copernicus, in his computations and his observations. Due to his work—mostly the work of observation, by the way—he did away with the notion that celestial bodies move on spheres or by means of spheres, which made it more imperative to find out how they did move.

Now Tycho Brahe, as you know, never agreed with Copernicus. On the contrary, he thought Copernicus was dead wrong. Copernicus said that this transition could only take place if the stars are very far away. And Brahe proceeded to compute how far away they must be if they were not to show parallax. By the way, I can't guarantee the figures I write—they are only approximately correct, but the order of magnitude is right.

In the ancient view, the distance from the center of the universe, namely, the earth, to the sphere of the fixed stars was approximately 20,000 radii of the earth. Now Brahe computed that, in order for the stars not to show parallax in the motion of the earth on its orbit, the stars had to be 60,000,000 earth radii away, that is, 3,000 times farther away as a minimum requirement.

Then he argued: look what happens. Here is the sun, according to Copernicus, at the center. Then there are, in this succession, Mercury, Venus, the earth, Mars, Jupiter and Saturn, and then the stars are very far away. That means that between the region of Saturn and the fixed stars, especially since there is no rigid sphere anymore, there is nothing. Nothing. Could God have done that? Such a waste of space. And, furthermore, which is much, much worse, if the stars are that far away and I can still see them, twinkling at this immense distance, think how big they must be. One must be bigger than the solar system—certainly bigger than the great circle. How can one imagine such a thing?

These are the two arguments of Brahe which, by the way, were absolutely reasonable. You, of course, are accustomed to this sort of thing—tremendous galaxies and so on.

How do you know, by the way?

These things are very difficult to understand and Brahe had a perfect right to put this difficulty before everyone. I suspect that Copernicus had asked himself the same question because, obviously, he was as intelligent as Brahe. I suspect that this has something to do with that strange and immensely interesting little remark which he makes in the first chapter of the first book. He says that it is possible that this world of ours, including the sphere of the fixed stars which are far away, is simply a big hole in an infinite solid universe. He simply envisages this possibility. The best example is Swiss cheese.

There might even be more holes. One of the holes is ours and there we sit and enjoy life. Now the question is, by the way, there are many questions: why did Copernicus envisage this possibility? There is one thing about it which might have something to do with Brahe's objection. If there is this big hole extending to the sphere of the fixed stars set in the infinite solidity, then it is not quite impossible that there are

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many huge, fiery objects at the edge of this solid, which is also perhaps a kind of solid fire. And Brahe's objection was, since there was no solidity anymore beneath and beyond the moon, that there was an incredible expanse that could not be justified. Nevertheless, he said that Copernicus might be right.

Within Ptolemy's account of the planetary motions, we could adopt the hypothesis of the moving eccentric circle for the outer planets and the hypothesis of the epicycle for the inner planets. In that case we have the centers of the eccentric circles and the centers of the epicycles all moving with the speed of the mean sun. Then, why not identify those centers with the sun itself?⁸ And so Brahe had this simple and wonderful system in which all the planets move around the sun, and the sun and moon move around the earth. Now I maintain that all appearances and phenomena from 1543 for centuries after are completely justified and made intelligible by Brahe's theory. This includes Venus, by the way, which does not appear sixteen times bigger at some times than at others. Even all the things that Galileo saw fit completely into Brahe's pattern.

And now I must tell you what Galileo saw. In 1610 when he looked at the sky by means of a telescope—one of the most exciting moments in the history of man—he saw, first of all, that the moon's surface is like that of the earth. That is strange, although we are very used to it. (One of the craters here is now called Copernicus, but that doesn't mean much.) Secondly, he saw that the light of the stars was conspicuously different from that of the planets; thirdly, that the Milky Way is a conglomeration of stars. He saw the four moons of Jupiter and that Saturn had a strange shape which he called three-cornered. Not until a little later did it become clear that this last was not three-cornered, but a ring. After a while he saw that Venus had phases like the moon. And then finally he saw the spots on the sun which everyone had seen before but never interpreted as belonging to the sun. They also were supposed to have belonged to the sublunar sphere. [These things do not necessarily support Copernicus' view.]

You must understand what the incredible excitement was when people looked through this rude kind of telescope and saw that. Nevertheless, simply looking through a fantastic new machine didn't vitiate anything. What went on in that machine had to be evolved into a theory. People were deeply impressed by these new phenomena, but every single one could be explained by Brahe's theory.

And now this is the important thing. Many people of the time *did* accept Brahe's theory. That is, in 1610 and after, many respectable professors of astronomy in all the universities of Europe accepted Brahe's theory. And it was the right thing to do: it was reasonable, accounted for all these appearances, and it preserved the theories and savings of the other phenomena as they were done by Ptolemy. Don't forget that Brahe's theory is, again, merely a transition.

And, yet, there were some people who said no. There were

some people who said that Copernicus was right, and only Copernicus—that the earth does move and there is nothing hypothetical about it. There was no physical evidence for accepting the Copernican theory until the 19th century. Instruments that could show the distances of the stars and the parallax came much later, in 1837. The rotation of the earth can be shown by a certain experiment which was first performed in 1851. It had been tried before but never was conclusive.

The question is: what made some people, not too many, don't forget, claim that Copernicus was right? I spent some time in counting the number of people who accepted this theory. I cannot guarantee the accuracy of this because, if I kept searching and kept reading books and I don't know what, I would come to a greater number. I know of 25 people certainly who, in the course of 70 years, accepted the Copernican theory. I don't think that this number can be increased to more than 40 with any amount of research. So 40 people accepted that. And the interesting thing is *how* they accepted it. They accepted it as if everything depended on it, as if this were the only thing, as if the life of mankind would be different after acceptance of this. Men of the greatest importance—certainly Galileo and Kepler—accepted it. Giordano Bruno accepted it. And what I want to ask is—why?

I shall read part of the Preface to *On the Revolutions of the Celestial Spheres*, which, as you all know, was written not by Copernicus but by his pupil, Osiander, who feared certain things:

Then, in turning to the causes of these motions or the hypotheses about them, he must conceive of a device, since he cannot in any way attain to the true causes. He must conceive of and devise such hypotheses as, being assumed, would enable the motions to be calculated correctly from the principles of geometry, for the future as well as the past. (This is what is done in Ptolemy all the time.) The present author, Copernicus, has performed these duties excellently. For these hypotheses need not be true nor even probable; if they provide a calculus consistent with the observations, that alone is sufficient. Perhaps there is some person so ignorant of geometry and optics that he regards the epicycle of Venus as probable and thinks that this is the reason why Venus sometimes follows or precedes the sun by 40° or even more. Is there anyone who is not aware that from this assumption it follows that the diameter of the planet at perigee must appear more than four times, and the body of the planet more than sixteen times, as great as in the apogee—a result contradicted by the experience of every age? In this study there are other no less important absurdities which I will not state here. It is quite clear that the causes of the apparent, unequal motions are simply unknown to this art. And if any causes are devised by the imagination, as indeed very many are, they are not

8. Winfree Smith wrote the sentences up to this point in this paragraph to substitute for a murky passage in the transcription.

put forward as if they were *true*, but merely to provide a correct basis for calculations. When, from time to time, different hypotheses are offered to explain one and the same motion (as, for instance, eccentricity and an epicycle), the astronomer will accept above all others the one which is easiest to grasp. The philosopher will perhaps seek the semblance of the truth. But neither of them will understand or state any such thing as certain unless it has been divinely revealed to him. Let us, therefore, permit these new hypotheses to become known together with the ancient hypotheses, which are no more probable. Let us do so especially because the new hypotheses are admirable and also simple, and bring with them a huge treasure of skillful observations. So far as hypotheses are concerned, let no one expect anything certain from astronomy, which cannot furnish anything of the kind, lest he accept as the truth ideas conceived for another purpose, and depart from the study a greater fool than when he entered. Farewell.⁹

I say: why wasn't that accepted? Why, on the contrary, should a certain man, 80 years later, say of this very good Osiander that he is "an ignorant and arrogant ass, who pretends to help Copernicus, but who only permits people like himself to pick lettuce and vegetables in that book"?

Let me say that the usual understanding is that Osiander wrote the preface in order to protect Copernicus from persecution by the Church. This seems to me a terribly simple and, I would say, not quite true statement. It is true that, from the very beginning, everybody was a little apprehensive about what the ecclesiastical authorities would say. By the way, it was not only the Catholic ones; it was also the ones in Wittenberg, especially the Protestants and Lutherans.

And immediately after publication of the book, a whole literature sprang into being (Rheticus among the first of these writers) to prove that this astronomical theorizing did not in any way contradict scripture. This literature persisted, literally, for a hundred years. Everyone participated in writing some kind of book or pamphlet or letter to show that what is stated in the scripture is not contradicted in any way by what is stated in Copernicus, that the scripture talks a certain language which is not scientific language, and that it is silly to assume that divine revelation has to be of an astronomical nature. This is perfectly true by the way and I, personally, don't think that this is the essential point in the struggle.

Further, I do not think that Osiander simply meant to protect Copernicus from the persecution of the Church. I rather think that he was, in this preface at least, quite seriously of the opinion that truth about these matters can only be revealed divinely and that we men must be satisfied with certain mathematical devices, according to the lights that God has given us. Also, it is not the job of astronomy to state the

truth. I do not state this as true, but it is quite possible that Osiander felt this strongly.

And let me also say that, later on, when Galileo, who is *the* great Copernican, was indeed convicted by the Church in Rome, the charge wasn't for entertaining such hypotheses. He was convicted for stating these hypotheses as truth, and the only truth. There is no other reason.

The Church did not forbid men to try to show that the appearances in the heavens could be saved and made intelligible by the Copernican assumptions. The Church forbade men to state this as *the* truth; as a matter of fact, there was something right about that.

Why are the Church and Protestant authorities so concerned about this—concerned not immediately after 1543, by the way, but about 60 years later? This is not simple. This is very dark at this point. Do not forget that the vulgar kind of arguments for the salvation of the soul and such cannot be advanced, for they simply don't hold water. It is too easy to show that Copernicus doesn't contradict scripture. It is easy to show that what the Church teaches is affected not at all by heliocentric or other systems. On the one hand, there is a kind of black obdurance on the part of the ecclesiastical authorities and, on the other, a kind of wonderful insight on the part of the "scientists." It doesn't seem to me that this is simply the case. I think that it can be shown that this is not true.

People insisted that the Copernican system was truth without sufficient evidence, and the ecclesiastical authorities combated this opinion without ever stating why. Now this is a very interesting thing, because it is in this that the Copernican revolution truly consists. The question is then: what are the reasons? And I will give you four—four very different reasons which do not at all, by the way, go together. I wish they would go together, but they don't. I would even say that they contradict each other—at least in part.

The first one is simple. I must repeat the question: why did people so fanatically claim that something was true, although there was no real evidence? And, on the other hand, why did the Church and other authorities oppose this, although it wasn't clear why it was so terribly important that they should do so? Now I am concerned with 25 or 40 people. Historically, and now I must speak historically, this is the time when nothing pleases more than that which is not accepted. Such times are called revolutionary. This is the time when the authorities of Aristotle and all the ancients, of Thomas, of the Pope, of kings, become shaky. It suddenly seems wonderful to come up and say: that which I learned from Ptolemy is all nonsense; it should be just the other way around. And sometimes this is one of the strongest ways to convince people. I give you a diabolic device: in seminar, sometimes, try this. Don't pick simply a little point, but say about the whole: that's all wrong—it's *JUST THE OTHER WAY AROUND*. Shortly, everyone will agree with you, maybe. Now this general kind of opposition is one of the reasons that one can advance. It pervades the times and there is something very attractive about that. Let me hasten to add that it's a rather poor reason, not unimportant, but poor.

And in this case it is important—the universe is stated to

9. From Osiander's address to the reader at the beginning of *On the Revolutions of the Celestial Spheres*. The translation is Klein's.

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be just the other way around. In Ptolemy the earth is in the middle and the sun revolves around it at a certain distance. And now Copernicus and all of his immediate and later followers say that the sun is in the middle and the earth is where the sun was. Simply a reversal. And you must not forget that this is not simply stated as a geometrical transposition and astronomical theory, but as the truth. . . .

Now [there] is something which I will call the Protagorean fascination. I refer to the man called Protagoras, whom you have met in Platonic dialogues, among other places. Now we know from tradition that Protagoras has a famous sentence which is called, in the sixty-four dollar phrase, the *homo mensura* proposition, and you have all heard about that. "Man is the measure of all things, of those that are that they are and of those that are not that they are not." Now Copernicus in the dedication to the Pope says, and I quote:

I finally discovered through long and intensive study that if the movements of the other wandering stars were referred to the circle of movement of the earth, and if the movements were computed in accordance with the revolution of each star, not only would the phenomena they present follow from that but also the order in magnitudes of all the planets and of their orbits, and it would bind the Heavens together so closely that nothing could be transposed in any part of them without disrupting the remaining parts in the universe as a whole."

Then in the beginning of the fifth book he says, "The mobility of the earth binds together the order and magnitude of the planets' orbital circles in a wonderful harmony and sure symmetry." Rheticus, again in that first report says, I quote:

These phenomena, the apparent motions of the planets, besides being ascribed to the planets, can be explained, as my teacher shows, by irregular motion of the globe of the earth, that is, by having the sun occupy the center of the universe while the earth revolves, instead of the sun, on the eccentric circle which it has pleased him to name the great circle. Indeed, there is something divine in the circumstance that a sure understanding of celestial phenomena must depend upon the regular and uniform motions of the terrestrial globe alone.

By the way, the expression "great circle," (the Latin is *orbis magnus*) is used until the late 17th century, even Locke uses it. About the six moving spheres of the other planets, Rheticus says, "their common measure is the great circle which carries the earth, just as the radius of the earth is the common measure of the circles of the moon, the distance of the sun from the moon, et cetera." And, by the way, he has something to say about the expression "great circle." He says, "if emperors have received the surname 'Great' on account of successful exploits in war, of conquest, of peoples, surely this circle deserves to have that august name applied to it. For

almost alone it makes us share in the laws of the celestial state, corrects all the errors of the motions and restores to its rank this most beautiful part of philosophy."

The orbit of the earth, then, is the great unifying factor in the spectacle of the wandering stars. Moreover, the daily motion of the earth, its rotation around its own axis, accounts for the daily motion of all the other stars. The higher and more universal similitude in all the hypotheses of the planets becomes an *identity* in Copernicus. We see the earth's motion in its orbit projected into the heavens in the guise of the irregular motion of the planets, especially their apparent retrogradations. The irregular motion of the planets is the result of their own regular motion plus *our* regular motion. The appearance of irregularity is due to the different rates of speed of the planets and of the earth. Our own motion, more precisely, the difference between our motion and the other planets, projected outside of us, is visible in the heavens. We see it, as it were, in a mirror, as an image. I quote Copernicus: "When a ship floats over a tranquil sea, all the things outside seem to the voyagers to be moving in a movement which is the image of their own. And they think, on the contrary, that they themselves or the things with them are at rest." We determine *by our motion* the appearances in the heavens. Once we understand that, we also understand that, to quote Rheticus, "the order and the motions of the heavenly spheres agree in a most absolute system." The Protagorean proposition receives an absolute twist: applying the right measure, namely, our own motion, to things outside our orbit, we grasp their true and absolute order. The measure becomes an absolute measure.

Kepler's astronomy, as well as his physics, is under the spell of what I have been calling the Protagorean fascination. The earth is to him "the home of the contemplative creature," that's a quotation, "of the measuring creature," and occupies a position in the universe most suitable for measuring purposes. The orbit of the earth is the yardstick of the universe. Far from detracting from the dignity of man, which some people say the Copernican theory does, the new function of the earth gives man an unprecedented dignity and priority. . . .

Any cosmology is a science of the order in which and through which everything exists. This cosmology, as any cosmology, has certain metaphysical and theological implications. Now, for the first time in a long period, the sun has recovered its former position of dignity, which we observe in Plato, in the neo-Platonic tradition, and in a certain cult called the Mithras cult.

The Mithras cult is the cult of the sun-god. In the early centuries A.D., it was as popular as Christianity. At certain points in the history of Christianity it is very difficult to distinguish the part that Jesus plays from that of Mithras, the sun-god. This, by the way, is not my opinion—it is part of a long tradition that stems from the Orphic and other ancient mysteries. Macrobius, a pagan writer of early Christian times, says:

It is not a vain supposition to believe that almost all

gods, to wit, the celestial ones, refer to the sun. A divine reason supports this belief. The sun is the ruler of the universe.

Behind this is that tradition I mentioned before, which goes back unbroken to the early Greeks. You can find such statements everywhere—the sun is the ruler of the universe, the king of the universe, the father of the universe, the self-born father of the universe. Proclus, whom you know as one of the great commentators of Plato and Aristotle, wrote a hymn to the sun. And I will quote a bit of it from the translation by Thomas Taylor:

Hear Golden Titan, King of Mental Fire, Ruler of Light—to Thee Supreme belongs the splendid key of life's prolific font. And from on high, Thou pourest harmonic streams in rich abundance into . . . [the] world. Hear, for, high raised about the ethereal plains and in the world's bright middle orb, Thou reignest. While all things by thy sovereign power are filled with mind exciting providential care. . . .

Now this tradition, and there are many more examples of the kind, was perfectly well known to Copernicus and his followers. Copernicus himself mentions in the tenth chapter of the first book that the sun is the lamp of a very beautiful temple, lantern of the world, mind of the world, mentor of the world. He quotes Hermes Trismegistus (a fantastic man who is quoted by everyone in a broad neo-Pythagorean and gnostic literature, and no one knows who he is) as having called the sun the visible God. Copernicus also, as you remember, quotes Sophocles: "The sun is that which sees everything." Now he translated Sophocles from Greek into Latin and he knew him very well. And in Sophocles you can find many things of this sort; for instance, in *Oedipus*, he says:

Sun, God of all gods, the father of everything . . .
everyone worships the whirling disk of the sun. . . .

Rheticus, when he comes to speak of the sun in the *Narratio Prima*, says:

The sun was called by the ancients leader, governor of nature, and king. But whether it carries on this administration as God rules the entire universe, a rule excellently described by Aristotle in *De mundo*, or whether, traversing the entire heavens so often and resting nowhere, it acts as God's administrator in nature, seems not yet altogether explained and settled.

Now let me repeat this thing of Rheticus in order to be perfectly clear. There are two ways in which the ancients seemed to see the sun, either as God ruling the universe or as the administrator of nature empowered by God. Which of the assumptions is preferable, he leaves to be determined by the

geometers and philosophers who are mathematically equipped, for without mathematics this cannot be solved. In the trial and decisions of such controversies a verdict must be reached, not in accordance with plausible opinions, but with mathematical laws. The former manner of rule, that is, that God rules the universe, has been set aside, and the latter accepted, that the sun does not rule as God rules, but as an administrator empowered by God. He goes on:

My teacher (that's Copernicus) is convinced, however, that the rejected method of the sun's rule in the realm of nature must be revived, but in such a way that the received and accepted method retains its place. For he is aware that, in human affairs, the emperor need not himself hurry from city to city in order to perform the duty imposed on him by God; and that the heart does not move to the head or feet or other parts of the body to sustain the living creature, but fulfills its function through other organs designed by God for that purpose.

He's saying, then, that if the sun moves around in the heavens a controversy might arise, since the ancients spoke of the sun as the ruler of the universe. Does it mean that the sun is God? Or does it mean that God entrusted to a divine messenger the subsidiary role of a minister who goes around the universe to see that everything is in order. That controversy has been adopted, but his teacher now says that that is all changed now because the others move around but the sun stays fixed—right in the center.

Now it seems to me (this belongs to the 30% opinion in this lecture) that this had something to do with the fanaticism with which the Copernican theory was adopted, in the sense that a suppressed ancient theology of the sun rose to the surface. This then would be what the ecclesiastical authorities were afraid of really, because this would mean a real revival of pagan understanding. And Rheticus seems to me, in what I have quoted, to state that quite clearly.

It was certainly, you understand, not a very popular movement. It was confined to a small group of people who had an esoteric cult, who nowadays would be called *intelligentsia*—a strange word from Russia. That is a thing which has happened, and which will happen, often. It is a thing which has many possibilities if once you understand the full implications of it. I don't think you can ignore this when you look in the middle of the 16th century and see the whole world in a great excitement over the very foundations and meanings of religion. So I think we can call this one of the reasons why Copernicus was put forward by certain people. . . .

Now we have a curious document. And that is a book called *The City of the Sun* by Campanella. [Campanella was one of the people who championed Copernicus.] He was born in 1568 and died in 1639. He lived mostly in jail, mainly for political reasons—the attempt to overthrow the kingdom of Naples to establish a republic, and so on. He wrote a defense of Galileo in 1616, the year of his condemnation, and began

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writing *The City of the Sun* in 1602. It was first published in Italian in 1614, then translated into Latin and published in 1623. The book is conceived after the model of Plato's *Republic*. It is written in direct opposition to *The City of God*. And throughout the book there is a constant transposing, and upsidedownness.

Somewhere in the book, speaking of the people in that city, he says, "they praise Ptolemy, admire Copernicus, but place Aristarchus and Philolaus before him." In fact, the cosmological basis of the book seems to be not Copernicus but Tycho Brahe. But it is not difficult to see its Copernican roots. Let me quote:

They (the people in the city) say it is very doubtful whether the world is made from nothing, or from the ruins of other worlds, or from chaos, but they certainly think that it was made, and did not exist from eternity. Therefore, they disregard Aristotle whom they consider a logician and not a philosopher. From analogies with other writers they can draw many arguments against the eternity of the world. The sun and the stars they regard, so to speak, as the living representatives and signs of God, as the temples and holy living altars, and they honor but do not worship them. Beyond all other things they venerate the sun, but they consider no created thing worthy the adoration of worship. This they give to God alone, and they serve Him that they may not come into the power of a tyrant and fall into misery by undergoing punishment inflicted on them by creatures of revenge. They contemplate and know God in the image of the sun and they call it the sign of God, His face and living image, from which light, heat, life and the making of all things good and bad proceed. Therefore, they have built an altar like to the sun in shape, and the priests praise God in the sun and in the stars, as it were, His altars, and in the heaven, as it were, His temple; and they pray to good angels who are, so to speak, the intercessors living in the stars. For God long since has sent signs of the beauty in heaven and of His glory in the sun. (They reject Ptolemy's and Copernicus' eccentrics and epicycles.) They say there is but one heaven. And the planets move and rise by themselves when they approach the sun or are in conjunction with it.

Campanella seems to have been the first champion of what became known later as the natural religion. All positive religions, including Christianity, were considered by him merely political and social institutions. He saw himself as entrusted with a great mission to establish before the end of the world the religion, the laws, and the perfect republic of the golden age. In 1632 he writes to Galileo as follows: "I venture to say that if we could spend one year together in a country house great things would be accomplished. These novelties of ancient truth, the new worlds, new stars, new systems, new nations, are the beginning of a new era. May he who guides the

universe make haste. As for us, let us help him on our small globe. Amen." He considered Columbus the greatest of heroes: "Spain found the new world so that all nations could be gathered under one law." *The City of the Sun* is the blueprint of the new order, of the one law, under which mankind was to live in the approaching golden and last age. The high priest personifying the new law was called Sol, which is the Latin word for sun, in the edition of 1623. And Campanella also uses the astronomical symbol ☉ for the sun to designate him. The main helpers of the priest are Pon, the abbreviation for *potentia*, power; Sin, abbreviation for *sapientia* or *scientia*, wisdom, knowledge; and Mor for *amour*, love: the natural trinity—and this is under the direct influence of Giordano Bruno.

The sun for Campanella is not God. It is an image or a symbol of divinity. God itself is the universal reason. To worship God is to follow reason, that is, to free oneself from all institutional chains, to be a "free thinker". In the letter to Galileo I just mentioned, Campanella refers to the personage who in Galileo's dialogues represents unbiased reason, as a "free mind". And, by the way, Kepler calls Copernicus that too. But Rheticus had already chosen as a model for the first report (*Narratio Prima*) this sentence of Albinus, which was attributed to Alcinous, and he quotes the sentence again in his book. And the sentence is: "Free in mind must he be who desires to have understanding." That's what Copernicans saw in Copernicus. And that's why there has been a Copernican revolution. . . .

[There is finally] the question of the immensity of the universe, which seemed to be foremost in the minds of certain people, notably a man named Giordano Bruno. It is the idea of immensity that fascinates Bruno. Copernicus himself, as you have seen, hesitates to attribute infinity to the world. He says that "the heavens are immense and present the aspect of an infinite magnitude." Bruno blames Copernicus because he does not say whether the universe is finite or infinite. "If the first principle is the creator of the world," Bruno says, "he is an infinite one and the creator of an infinite effect. As the active power of God is infinite, so is the subject worked upon by it. . . . If he intended body and dimensions, he intended them to be infinite. . . . The intelligible species of body is infinite." The intelligible species of body is space.

Why is this so important? The finiteness of the world is a main point for the ancients and for the medievals. The Aristotelian philosophy stands or falls with the finiteness of the world. For Aristotle, there is nothing outside, not even nothing. There is a clear understanding of what *πέρας* means. This seems to be in contradiction with the infinite power of God. The understanding of God as an infinite being begins in the sixteenth century. One of the assumptions of our mathematical science is the infinity of God. We have forgotten that the Copernican revolution is a revolution.

May I repeat again that everything that I said cannot be convincing, can only raise certain questions and lead you to consider certain problems and read certain books. It is now ten to ten. I am perfectly willing to sit here and answer questions.

On a Sixteenth Century Algebraist

by Jacob Klein

After reading the title of this paper you certainly did not expect that it would deal with mathematics. And I think you were right. I feel, however, that the short historical survey I am going to make may interest you on account of its relation to the foundations of modern mathematics. Although the development of human thought is continuous, it can be fairly said that the foundations of modern mathematics were laid by two men: Francois Viète (or Vieta) and Simon Stevin. I will deal with the latter only.

In the first place I must admit that the title of this paper is misleading, since Stevin died in 1620 and belongs, therefore, also to the 17th century. But his main work, entitled *Arithmetic*, appeared in 1585. The time at my disposal is very short. So I can talk only about the first pages of this work which contain to my opinion propositions fundamental to the modern understanding of mathematics—especially Algebra.

But let me first say a few words about the life of Stevin. He was born in 1548, five years after the publication of the great book of Copernicus. He was of Flemish stock and lived in a part of Europe, namely the Netherlands, which after their declaration of independence in 1581 became a centre of learning and education and actually the first European country having religious tolerance. Like many men of his time, Stevin was active in very different practical and theoretical fields. It is characteristic of his way of thinking never to separate theory and practice. He was an engineer who constructed dams, bridges, marine fortifications; furthermore, he was Quartermaster General of the Dutch army, General Comptroller of the finances; he thought out improvements in the methods of bookkeeping; he was an astronomer, a geographer, a linguist; his main interest, however, lay in the mechanical arts, especially statics, and in mathematics, especially Algebra; he made the discovery of the principle of the parallelogram of forces and is best known for that; and he was

the most advanced algebraist of his time. He was very much aware of the peculiarity and novelty of his intellectual preoccupations. His own interpretation of his work—and this is important—is characteristic of the way in which modern science thinks about itself. He was captivated by the idea of an “age of wisdom” which had existed before the Greeks and which he and his contemporaries were going to renew. The 16th century as a whole strove for a renewal, a rebirth, a restoration of almost lost or forgotten wisdoms. Stevin is peculiar in that he goes back beyond the Greeks. He gives a “definition” of the “age of wisdom” thus:

We call age of wisdom that age wherein men have had an admirable knowledge of the sciences, and this age we recognize infallibly by certain marks, although we do not know who those people were or where they lived or at what time.

At any rate, he calls the entire period from the Greeks to the 15th century the “age of barbarism”. And he thinks that the leading personalities of that age of wisdom which precedes the age of barbarism were for example Zeus, Hermes, Apollo and other Greek gods as well as Abraham, Isaac, Moses and other people in the Old Testament. For him all these personages were actually scientists whom the age of barbarism misrepresented as gods or shepherds.

In order to restore the “age of wisdom,” he proposes a general plan of scientific research—the first of this kind, I presume—containing four articles: 1) As many observations as possible should be made, especially in Astronomy, Alchemy (that is to say, Chemistry) and Medicine, by a great many people living in different regions of the earth and belonging to different nations; 2) The results thus obtained should be expounded methodically, according to the mathematical method used by Euclid. The order followed by Euclid is to Stevin’s mind the “natural order” which that Greek author had gotten somehow from the “age of wisdom”; 3) It is possible to carry out so many observations by so many people only if these people use their own language and not the scholarly Latin, the command of which is possessed by

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but a few people. Even the Greeks used their own language and not a special learned or artificial one; 4) It might, however, be very convenient to use the Flemish idiom, because of the abundance of monosyllabic words in that language. For science requires terms, and terms are often very complex words; the composition of words is easily done, if the words are monosyllabic. Hence the usefulness of the Flemish idiom, which is much richer in monosyllables than French or Latin or Greek, as Stevin tries to demonstrate statistically. As a matter of fact, Stevin taught mathematics only in Flemish and wrote most of his works in this language, although he knew Latin and himself translated some of his works into French. His official title at the University of Leyden was "Professor of Dutch Mathematics". (Flemish and Dutch were identical at that time.) It is noteworthy that Descartes, who probably was his disciple in 1618-1619, writes in a letter of January 1619 that at that time he is mostly concerned with the study of the Flemish language (*sermo Belgicus*, as he calls it in Latin). We shall see why the influence of Stevin on Descartes is so decisive.

Stevin himself considered the question of a right language highly important and was rather pessimistic about the possibility of renewing the age of wisdom merely on account of the unfortunate fact that the Flemish language was used on this earth by a comparatively small number of people. But on a different level he found the proper, and at the same time universal, language in the symbolism of Arithmetic and Algebra. And that is the topic which we shall now approach. What reason did he have for going back beyond the Greeks and for formulating the hypothesis of an "age of wisdom"—an hypothesis accepted by many of his contemporaries, and by Grotius among others? Mainly this: the Greeks had no notion of the Zero. The entire "age of barbarism" is characterized by this ignorance, whereas the "age of wisdom" is distinguished by the knowledge of the Zero and the Arabic numeral system.

The Arabic numeral system had been brought into Europe in the 12th century and had been in constant use since then. But it was Stevin who first recognized the tremendous importance of this innovation. Of course, the Greeks also were able to reckon and to solve problems, which we today call arithmetical and which they called logistical. But calculation and also the solution of numerical equations did not belong for them to Science in the proper sense of the term. Stevin ascribes that fact to a fundamental confusion on their part with respect to their use of this sign: ".". According to Stevin the point "." was the sign for 0 in the "age of wisdom". The Greeks, however, misinterpreted this Zero-sign as the sign for the Unit. Hence a great many fundamental errors, for ex-

ample: the definition of number, the definition of the principle of number, the distinction between Geometry and Arithmetic, the misunderstanding of the nature of Algebra.

According to the Greeks, the definition of number is "multitude of units," a definition universally accepted until the 17th century. The principle of number is the Unit, in the sense that you cannot count without distinguishing the single units of a number, whatever the number or the units in question might be: apples or horses or stars or pure mathematical units. The Unit or the One is, therefore, not a number itself. The main consequence of this understanding of the Unit and the Number is the sharp distinction between the numbers, as consisting of separated, discrete units, and the continuous magnitudes, as lines, planes or solids, that is to say, the sharp distinction between Arithmetic and Geometry. Furthermore, numbers in the precise sense of the word (in Greek *ἀριθμοί*) are only integers. Fractions are understood as parts of the unit occurring in the calculation. Fractions are not numbers. Scientifically they can be dealt with as ratios, more exactly as ratios between integers. "Negative" and "irrational" numbers are not conceivable at all. During the 15th and 16th centuries irrational numbers, although actually used by calculators and algebraists, are called "absurd" or "inexplicable" or "deaf" numbers. As late as 1560 a French mathematician, Peletier, admits readily that we cannot avoid making use of such "inexplicable" numbers, especially in measuring continuous magnitudes, but goes on to say that their relation to true or "absolute" numbers (as he calls them) is similar to that of beasts to men.

According to Stevin, all this is the consequence of the wrong definition of the principle of number. Says he: "O unhappy hour wherein was first uttered this definition of the principle of number! O cause of the difficulty and obscurity of things which in Nature are so easy and clear!" To him, "in Nature" the true principle of number is the Zero, which he calls the "arithmetical point," in analogy to the principle of the line, namely the "geometrical point". That is even more than an analogy. To understand the full extent of Stevin's radicalism in mathematics, we have to consider for one moment the arabic system of numeration in itself.

The Arabic numeral system has two main features: 1) it is a decimal system, and 2) it is a system of positional numeration. The composition of signs in 333 is of the kind that the sign 3 in the middle means thirty and the sign 3 on the left means three hundred, merely on account of their respective positions. The decimal numeration as such is common to many peoples. The positional numeration as such was already used by the Babylonians, or more exactly Sumerians, but on the basis of the sexagesimal system. The arabic system is

unique in that it combines both, the decimal and the positional numeration. Stevin was the first to draw the final consequences out of these characters of the numeral system of the Arabs, whom he was inclined to consider as the true heirs of the unknown peoples of the "age of wisdom". To begin with, he identified the ciphers, the signs meaning the various numbers, with the numbers themselves. Thus he was able to argue as follows. We can see that the Zero and not the Unit is the principle of Number and that the Zero is the equivalent of a geometrical point by comparing directly the succession of ciphers with the extension of a line. A line is not extended through the addition of one or many points. Nor is a number increased by addition of one or many Zeros. But even if we think of a quasi-extension of a line through the addition of a point thus:



we can conceive a quasi-increase of a number through the addition of a Zero, thus: 0.6, 0.60. This argument involves the use of decimal fractions. I shall return to this point in a moment. But the argument shows clearly that Stevin could not conceive of a difference between the nature of a continuous magnitude and the nature of a discrete number. The unit and any fraction of the unit are parts of a number, and consequently numbers themselves, just as a fraction of a line is part of that line, and consequently a line itself. The Zero, however, is not a part of a number, but a principle of number, just as the point is not part of a magnitude, but a principle of magnitude. Therefore, number and magnitude are not to be distinguished through discreteness and continuity. He says: "As to a continuum of water there corresponds a continuum of humidity, so to a continuous magnitude there corresponds a continuous number. Again, as the continuum of humidity of all the water undergoes the same division and separation as the water, so the continuous number undergoes the same division and separation as the magnitude." In other words: for Stevin there is not only an analogy between the Zero and the point or between number and magnitude, but perfect correspondence. In this respect his influence on Descartes cannot be overestimated. In fact, Stevin thus contributed more than anybody else to Descartes' discovery of Analytical Geometry. Descartes—and this applies more or less also to Fermat—interpreted Apollonius, as it were, through the eyes of Stevin.

A further consequence of Stevin's understanding of the arabic positional numeration was the recognition of irrational quantities as true numbers. It has been only since Stevin that

we could speak of rational as well as of irrational numbers. Stevin also understood an expression like this: $4x^2 - \sqrt{5}x + 3$ as one number, which he called a number representing an "algebraic multinomial". He was also the first to understand subtraction as the addition of negative numbers.

I mentioned the use of decimal fractions by Stevin. Actually, he was not the first to use them, but he was the first to understand them as basically connected with the general system of numbers. The "tenfold progression"—as he says—of the decimal numeration can be continued infinitely not only to increase the numbers, but also to diminish them in the same way. Thus we can get rid of all fractions in the ordinary sense of the word. Whenever we deal with numbers, we have to put them in certain columns, as for example:

⑥	①	②	③	④
6	3	0	4	
5	4	0	1	
0	2	0	7	8

We would write the first number of this series, namely 6.304, in the following way:

$$6 (1/10)^0, 3 (1/10)^1, 0 (1/10)^2, 4 (1/10)^3$$

The ciphers within the circles are really decimal exponents. "He had understood that any decimal fraction was identical to an integer but for a decimal coefficient," as George Sarton put it. Thus he became the real discoverer of the decimal fractions as we use them today. Moreover, not only did he suggest the universal use of the decimal fractions, but he suggested also the application of the decimal system to all kinds of calculation and measurement. He demanded that all measures and weights be expressed in decimal units, a demand which was to be fulfilled in France during the French Revolution and which was later on followed by practically all the world, except for England and the United States. Strangely enough, Stevin linked his symbolism of the decimal system with that of his Algebra. He writes what we express today as the unknown quantities $x, x^2, x^3, x^4 \dots$ as follows ①, ②, ③, ④ \dots , whereas ⑥ means not—as we may think—the unit, but any known number.

I cannot speak about his Algebra any further, because my time is up. But I should like to emphasize that Stevin's idea of an "age of wisdom"—that is to say, a golden age of science or, more exactly, an algebraic age of science—is still leading the modern conception of Science in general. The only difference between the idea of Stevin and the modern outlook is that we place that golden age not in the past but in the future. It is a question, whether we are right.

MEMORIAL SERVICE FOR JACOB KLEIN

Born: March 3, 1899, Libau, Russia
Died: July 16, 1978, Annapolis, Maryland

St. John's College, Annapolis
September 29, 1978

Presiding—President Richard D. Weigle

Order of Speakers—

President Weigle
Curtis A. Wilson
Simon Kaplan
Samuel S. Kutler '54
Brother Robert Smith
J. Winfree Smith

Music by Douglas Allanbrook
Robert S. Bart
Robert G. Hazo '53
Barbara Dvorak Winiarski '55
Elliott Zuckerman
Eva T. H. Brann

Mr. Weigle spoke without a written text. He ended his remarks with the following passage from Jacob Klein's Dean's Statement of Educational Policy and Program 1958.

All a school can do—and St. John's is no exception—is to establish the conditions under which learning may take place. In some important respects the College has succeeded in doing that. The curriculum provides a wide basis for the exercise of the skills of discussion, translation, demonstration and experimentation which in turn help the learning mind to experience the discipline of the liberal arts and to acquire an understanding of them. It is not a panorama of opinions, or styles, or disciplines, or systems, it is the sharp edge of a crucial question, the stumbling block of a massive contradiction, the labyrinth of complexities in a given problem, that furnish link after link to the chain of learning offered to the student at St. John's.

One of the great virtues of teaching that goes on at St. John's is the *patience* with the shortcomings of the students, with the difficulties of a given subject matter explored in common, with the disappointments and frustrations, the faithful satellites of all teaching and learning.

All improvements of instructional patterns depend ultimately on the way the teacher follows them up, responsibly, patiently, generously, and full of fear before the immensity of the task.

Curtis A. Wilson

During a number of years—exceedingly memorable years for many of us—the first Friday-night lecture of the College year began with a statement that is likely to seem unremarkable enough when repeated now, but which I have never heard made by anyone else but the lecturer of those years, the then Dean of the College. Nor can I imagine its being made, with the same meaning and effect, by anyone else. I cannot quote exactly, but with some huffing and clearing of the throat, the lecturer would say something like this: I have to begin by saying that, before the immense, the immeasurable difficulty of my task, I am filled with trepidation. The task he was speaking of was, of course, to speak of the task of education, the task of this College.

He proceeded to do that with a certain soberness, slowly, deliberately, choosing words with care. The words were not fancy or technical; they were simple and arresting. We were asked to think—and first of all to think on the fact that our understanding of ourselves and, hence, of everything else was, of necessity, bound to intellectual traditions. And these traditions, while preserving the traces of the original insights and experiences from which they had sprung, necessarily did so only in a veiled and distorted way. That was an unavoidable consequence of our dependence on language, and of the

evanescence to which every understanding is inevitably subject. Hence this task: to penetrate through the layers of forgetfulness and distortion, to recover the foundations of our views and attitudes, and to assess, as far as possible, their truth.

An enormously difficult task; extravagantly ambitious, incompletable in a lifetime. Yet not to undertake it is to remain prisoner, chained, with vision confined to the shadow-play on the cave's wall. Hence an inescapable tension. On the one hand, there is the finitude of our human condition, of which we must not lose sight. And on the other there is the extravagant goal which is implicit in, yet transcendental to, every attempt to say the truth. This is the peculiar twofoldness in the Delphic Oracle's enigmatic command: know thyself.

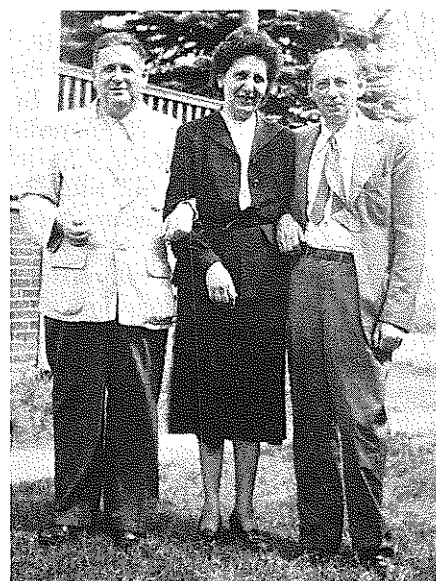
Jasha Klein, who often remarked with a special appreciation that someone or something was in some way remarkable, was himself the most remarkable person that many of us are ever likely to know. His gifts of imagination and intelligence and judgment were truly extraordinary. But more remarkable still was their union with qualities of heart—spiritedness, warmth, a spontaneous and irrepressible energy, abundant enjoyment and delight in many things. And with such qualities of mind and heart, during many years, he devoted himself unstintingly to the teaching and learning at this college, believing, as he said, that the annoying and time-consuming efforts and tribulations that necessity imposes upon the teacher are—I am quoting—"beyond measure compensated by the insights he gains in the struggle with young and vigorous minds and in the witnessing of intellectual growth."

Teacher, guardian, guide, friend: it is impossible to think that he is gone, impossible not to imagine that he is looking on with a certain quizzical smile that some of us know. As for us, we shall pay proper tribute only if we recollect the meaning of the task of which he spoke so unforgettably, its difficulty, the constant danger of misconstruing it or reducing it to something other and less, its fearsome immensity.

Simon Kaplan

Mr. Weigle and Mr. Wilson spoke about Mr. Klein and his contribution to this College. I would like to say a few words as a friend of Mr. Klein, and trace our friendship, which lasted for more than a half of a century. More exactly, we first met in Berlin in 1925. I remember the day when a friend of mine told me that he had met a young man who was studying philosophy, and he proposed to invite him to our group, the members of which were mainly Russian emigrants interested in philosophy and theology. The participants of this group were Russian scholars of philosophy, theologians of the Russian Orthodox Church, and an Orthodox Talmudic scholar. There were also a few young people, such as Mr. Kojève, Mr. Klein, who brought also Mr. Strauss, and myself.

The fact that most of us were Russian emigrants who spoke Russian made this circle more personal and intimate. Mr. Klein was not an emigrant. Although he was born in Russia



Mr. & Mrs. Kaplan and Jacob Klein, 1938.

(as it turned out, in the same town as I), he was educated in Belgium and later in Germany. This made him a kind of cosmopolitan, speaking fluent Russian. He soon became one of us, and more intimate relations developed between the younger members of this group. Mr. Klein's penetrating mind, open to all kinds of problems, as well as his benevolent attitude toward his fellow man and his good-hearted readiness to help, impressed all of us.

It was in those years that Mr. Klein helped a common friend, who had difficulty in expressing himself, to write a logical treatise on negative judgement. It was also at that time that Mr. Klein translated from Russian into German a book on Dostoevsky by A. Steinberg, a common friend of ours. I think that it was at the same period that he helped somebody to write a Ph.D. thesis. All this was done at the time when Mr. Klein must have had enough worries about his own future. But he seemed not to be concerned about it.

At this point I have to say that this kind of selflessness and unconcern about his time and his own tasks and achievements has been a basic character trait of Mr. Klein, and this trait accompanied him until late in his life. He could patiently converse for hours, sitting with people in a coffee-house, disregarding any time limit. With his open and inquisitive mind, he could for hours listen to people as if he were trying to find out what lies behind the words of his not too articulate interlocutors.

This same selfless attitude, combined with an intellectual and humane interest in people, made Mr. Klein always generously available to everybody in the College, to a degree which seemed to some people a waste of time. There was in the College a few years ago a tutor who greatly admired Mr. Klein, but he used to say about him that he never saw a man so generously wasting his time.

In 1933 all of us had to leave Germany. Our group dispersed, and what remained was a lasting friendship between Mr. Klein, Mr. Strauss, Mr. Kojève, and myself. Mr. Klein,

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Mrs. Kaplan, and I met briefly again in Prague, and then we left Prague in different directions: Mrs. Kaplan and I went to Paris, and Mr. Klein to London and then to this country. We met again in 1941 in this country. By that time Mr. Klein was already at St. John's. He immediately suggested to Mr. Buchanan that I should teach at St. John's. When we came to Annapolis it was again Mr. Klein who was very helpful in introducing me to the program and in helping us to settle here.

These were the years of enthusiasm for the program of this college, and of endless discussions about it. For many years, Mr. Klein and other friends met regularly in our apartment after the Friday night discussion periods, and continued to converse, drinking tea until late at night. All of us were at that time younger, and drinking tea helped us to stay awake until late. It was on one such midnight that Mr. Klein and Mr. Winfree Smith appeared in our house with a shiny samovar to facilitate the tea drinking and the discussions.

After Mr. Klein's marriage, many years of friendship with Mrs. Klein and Mr. Klein followed.

I shall conclude my reminiscence about Mr. Klein by saying that Mrs. Kaplan and myself will always cherish the memory of our friendship with Mr. Klein and feel deeply indebted to him. His rare metaphysical gift, the precision and elegance of his mind, and his noble generosity to his fellow man will be long remembered by all of us in this community.

Samuel S. Kutler '54

There is a difficulty in speaking on just this occasion, for I am aware of how well Jacob Klein appreciated that precious gift that we all share: speech. It is easier to describe this in its negative instances. His anger would flare up when he heard speech being misused. Even late in his life, upon hearing in a question period a discussion of whether or not the apparent hierarchical ordering of the world was real or not, he shouted out, "What do you mean by *real*?" For he was quick to notice the presence of unrevealing speech. He called it sedimented speech. He said that he himself meant nothing by *real* except what he had learned, and that meant through years of dedicated study, from Plato and Aristotle. That same anger was turned, with even more emphasis, on himself: "What was the subject of your doctoral dissertation, Mr. Klein?" "It was on Hegel, and it wasn't worth the paper it was written on. IT WASN'T WORTH THE PAPER IT WAS WRITTEN ON." He knew that in his early life he had spoken and written in unrevealing ways, because later, with the help of his teacher, Heidegger, he had learned to get beneath the surface of things. He had learned to ask penetrating questions. Through careful study, he had formed illuminating opinions, which he recognized as opinions. "Don't believe this . . ." he would begin, as he offered a radically new way for me to look at a Platonic dialogue or a work of Nietzsche. These were amazing attempts to understand.

His thoughtfulness was not back there in antiquity. It was



Klein, Gisela and Lawrence Berns, and Eva Brann at Commencement at Annapolis, 1967.

present, right there and then, in whatever happened. Stalin's daughter had left Russia. She appeared on television. We each saw that program. "Do you understand what that shows?" "Nothing," I answered. "There was nothing important." "Don't you see that the nature of man was supposed to be changed by that revolution? She is just like everyone else."

What was Mr. Klein for me? I want to ask you to think of him, as I do, as a wealthy man. Not the kind of wealth that inspires envy. No one need have less, because he had more! I had arrived in 1950 at St. John's College with whatever stars were in my eyes brought there by the catalogue. By then Jacob Klein was Dean of the College. I couldn't tell very well the difference between Mr. Klein and the College, and it was for this reason: he was the very soul of the College. And at this College I became open to thoughts which began to touch me, finally very deeply, thoughts which otherwise, in all likelihood, I would never have entertained.

I learned much from Jacob Klein, but I don't know how! He was not one of my classroom teachers. It must have been magic. But some of it must have a prosaic explanation. Turn for a moment to that unjustly despised part of the St. John's Program: the formal lecture. I am not thinking now of the fine occasions when Mr. Klein lectured on a Platonic dialogue, on Aristotle, on Leibniz, on speech, on nature, on precision. I am thinking of how—week after week—as each lecturer appeared in the question period, when the discussion had been perhaps quite good, perhaps not so good, almost unfailingly Jacob Klein would ask a probing question which invited the lecturer, and all of us, to question one of the foundations of his whole talk. Maybe this would lead to fireworks as others joined in. At best it would lead to nothing decisive then; but years later those questions could be stirred

up in someone's thoughts, and a new way of looking at things would become possible to him. With his striking way of putting things, Mr. Klein was a wonderful teacher. Of course this was not a surface cleverness. It was backed up by years of careful study in those early years, when I knew him not at all.

But the fruits were there. There was the wonderful summer when the *Meno* book was written and last minute smoothing was taking place before it was sent to the publisher. For those of us who had not deserted tropical Annapolis, there were gatherings at the Kleins' to hear Jacob Klein read from his book. Because of the more than 750 footnotes, it was difficult to guess that the book was written to be read aloud. Mrs. Klein served one magnificent meal after the other, and in the evenings we discussed what was read. This went on for days. I don't believe that I have read that book all the way through. A lot of it must be in my bones.

And what about the earlier book on the notion of number that the ancients possessed and that we have lost thanks to the art of algebra and the works of Descartes and all? That book did not exist for the students, since it was then untranslated. Yet it was alive, for Mr. Klein would give talks at just the right time of year and share the fruits of his study. These talks were not easy to follow. Nor is the book. This isn't Jacob Klein's fault. Some things need to be studied many times. The paradox is that mathematical things ought to be pre-eminently learnable.

Yes, Mr. Klein had great wealth, shared wealth, which he bequeathed to all of us. Rather than make a speech about this, I want to ask myself what I am inspired to do. I know that when he was honored by the alumni association last year, he spoke a few words. He spoke of his long association with St. John's College. He said that he had tried to do his best. He cared so much for that activity of trying, of making a noble attempt.

To me it implies that to his memory I dedicate myself in these coming years, to trying ever harder to understand, and to caring for this College in which he invested so much.

To you—I don't dare, or hardly dare to say it—you should do so too.

Brother Robert Smith

From the beginning of the New Program I began to hear about St. John's. One of my teachers was acquainted with some of the original committee on the Liberal Arts at Chicago and had told me about the work done there and the decision to transform St. John's. I made up my mind to visit the College as soon as I had an opportunity. In the summer of 1943 I was able to do so.

When I arrived, armed with letters of introduction, I had only heard vaguely of a brilliant addition to the original faculty, Mr. Klein. As was proper, I arranged to meet Mr. Buchanan, and was invited to lunch by Mr. Barr. So much for the power of letters.

Then began the serious work of visiting classes and talking to everybody I could find. Jasha was teaching Ptolemy at the

time—it was a hot Annapolis summer. The College then had a summer semester. Jasha was asking about the relations between epicycles and eccentrics. Some students couldn't see how they could be used interchangeably. One explained the matter quite clearly. What he left unsaid Jasha completed brilliantly. He had everyone in admiration of how each explanation in its way helped to tell a likely story. The center of reasonableness and order seemed to be right there in that classroom. Just before the class ended Mr. Klein turned to one of the students who had not been able to speak well about either eccentrics or epicycles. The young man was an oriental, I believe (though memory may be playing tricks with me). Jasha pointed at him and said, "Mr. Chu, you are not a sinner. You need not look like a mourner. You just did not study. Tonight you will study, and tomorrow everything will be fine." Mr. Chu looked up shyly, half smiling.

Those two impressions of a brilliant teacher who made it seem that some things are wholly reasonable and of a man who spoke directly to his students in such a way that they could hear have remained. Nothing in the many years of intermittent association since that time has superseded or fundamentally changed those initial impressions.

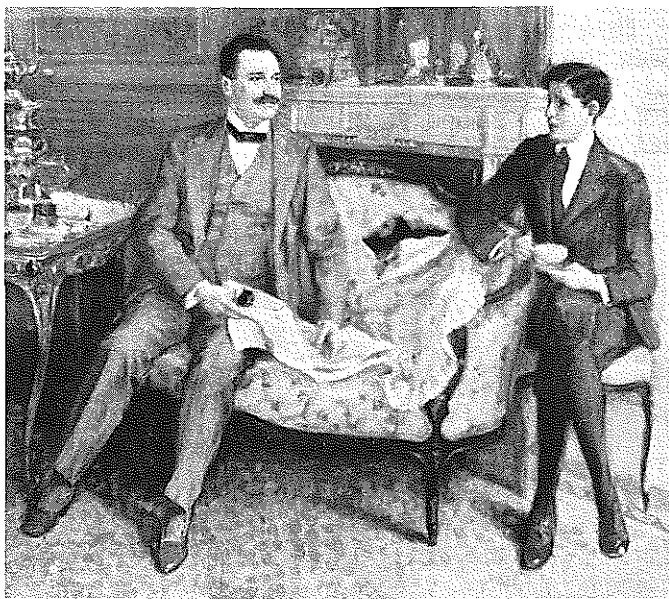
During the next few years I saw Jasha on many occasions and in a number of places. Once I met him in New York, just after he had spoken in Russian on the Voice of America. It was still, I think, war-time, or shortly afterward, and there was no jamming of American broadcasts. His subject was St. John's College; the talk was part of a series on American education. We had lunch afterwards, quite appropriately, in the Russian Tea Room. When Jasha told me the subject of the broadcast, he said, "Now my worlds are coming together." That comment was appropriate and important. We are all so used to thinking—and quite rightly—of St. John's as his world, that we may forget how many other worlds he belonged to, and how easily he moved in them, always showing the same intelligence, seriousness and wit that he displayed year after year in Annapolis.

For instance, his work, *Greek Mathematical Thought and the Origin of Algebra*, written in Germany, was published in Germany in 1934-1936, when Jasha had already left that country. To publish anything by some one named Jacob Klein at such a late date was bold, even dangerous. Jasha expressed admiration for those responsible, though I believe he was in disagreement, on other subjects, with one of those concerned. Their action showed how highly some people in Germany thought of his work, and how much his thought was part of what remained of German academic life.

One more illustration of Jasha's essential sameness in widely different settings. At least once, though somehow I think twice, Jasha came to visit Quebec while I was still living there. Once he came with Mr. and Mrs. Kaplan. Quebec was an international center then. Refugees from everywhere were there. Some were students; some were professors in the University; some simply lived there, talking of the war and planning their return to Europe when it would be over, or in some cases making plans for their part in a European future that seemed far off.

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I remember Jasha talking to two professors—one a Belgian, one a Frenchman recently escaped from extreme hardship in France. Hardship did not make him forget the manners of the French salon. There was an artful appeal to Jasha—who had gone to secondary school in Belgium—to confirm or perhaps discredit the Belgian's claim to the importance of his native and minuscule village. Jasha's response was all nuance and irony, as if his world too were that of the salon. In fact, it was the true world neither of him nor of the other two. Very shortly they turned the conversation to an author named Meyerson and to the question of truth in sociology. Not long ago I met the Frenchman who took part in that conversation and he asked about the professor brought up in Belgium who talked so well about Meyerson. He remembered Jasha for what was essential in him.



Portrait of father and son, Brussels, about 1914.

This international side of Jasha is not an accidental or unimportant fact about him. No one saw through sham and low-mindedness better than he. But almost no one else that I have known believed as much as he did in the possibility of Human greatness. What he admired in Virgil and Dante (witness what he said in his lecture on them) is that there could be nobility in political action. He admired greatness where he saw it. No one but Jasha would have used the opening pages of de Gaulle's memoirs in a language tutorial. On the other hand, failure on the part of gifted men to measure up to high office offended him personally. I remember that he once said of a man who held high office, "He is very intelligent, and extremely vulgar. The combination is hard to take."

No doubt Jasha thought other matters than politics were of the highest importance. He could and did say of the first seminar of the year, "This is the beginning of a great adventure, and what its result will be nobody knows." Still he remained a friend of Kojève. He knew and admired Sir Isaiah

Berlin and Raymond Aron. What they shared was a belief in and admiration for reason as it occasionally shone on the world of human affairs.

Jasha spoke many languages easily and comfortably. What one must say is that in all of them he spoke well and about what was important to him, to his hearers, and to all of us. This last phrase alone is important. He used his power in the service of what is best in us. That is why he and his wife could give so much of themselves without weariness or condescension. Jasha, when he was in middle age, called himself an Averroist, with full attention to what he was saying, and with his usual seriousness about how he used language. Averroes interpreted the words of Aristotle in the *de Anima* to mean that when we saw something of the eternal, the imperishable, it was the living light that was shining through us.

In the last public meeting where Jasha and Buchanan—so far as I know—addressed one another, Buchanan was talking of the perils to which the life of the mind was exposed. He said, "If reason lives . . ." Jasha interrupted him to say . . . "Reason lives." Buchanan smiled, and went on to say whatever it was he intended to say. Some seconds later he relapsed and said, "If reason is to live . . ." Jasha again interrupted, "Reason lives." This time Buchanan said, with, I think some sense of what he was saying and to whom he was talking, "Yes, reason lives."

J. Winfree Smith

My acquaintance with Jacob Klein began in 1939 shortly after he had come to be a Tutor at St. John's and when I was a graduate student in philosophy at the University of Virginia. He came in that year to the University of Virginia to read a paper to our philosophy club. The paper was about the way the Greek mathematicians understood numbers and the importance of that for Greek philosophy, especially Platonic philosophy. He took us back to the sixteenth century. He made us forget all modern sophistication about numbers, look at *ἀριθμοί*, and share with the Greeks the questions that they raised about the *ἀριθμοί* and that have to become our questions. He led us by simple steps to see that these questions lead to questions which are at the center of Plato's philosophizing about being, which questions are equally our questions. It was all done in a dramatic and exciting way.

I mention this particular episode because it seems to me that it typifies several things about Mr. Klein as a teacher. He believed that modern thought generally has so formed us that it puts a screen between us and the world, so that it is very difficult for us to look at things simply and directly. Yet he had a remarkable ability at least to produce certain moments of such looking and a remarkable ability to lead students (and I mean to include faculty as students) to see that, whatever we may make of the answers, there are genuine questions raised by both ancient books and modern books and that those questions are inevitably our questions unless we unphilosophically simply decide to turn our backs to them. He also knew that the dialectical art needs a rhetorical art to bring these ques-

tions out as live questions. Hence the drama and the excitement.

The range of Jacob Klein's interest and understanding and learning was immense. When on his 75th birthday he was presented with a collection of essays, Mr. Kutler read a list of the titles of lectures he had given here. Those lectures covered a tremendous variety of books and themes, great poetic works such as the *Iliad*, the *Aeneid*, and the *Purgatorio*, dialogues of Plato, the philosophy of Aristotle, the philosophy of Leibniz, the 19th century with Hegel and the anti-Hegelian Hegelians, Marx, Kierkegaard, and Nietzsche; and many, many more. Every one of these lectures contained something solid and something fresh. It was Mr. Klein, I believe, who was responsible for the addition of certain of the writings of Kierkegaard to our seminar list. There is one lecture he was thinking of giving, but did not give. The subject of that was to have been the thought of the apostle Paul.



Klein and Dr. Irwin Strauss, 1972.

I have already mentioned his concern with the effort to recover the insights and the questions of ancient philosophy. No doubt that concern was central, especially in recent years when his preceptorials always had to do with Platonic dialogues. Moreover, of the three books he wrote, two are about Platonic dialogues and even the third is designed to show how intimately connected the difference between ancient and modern mathematics is with the difference between ancient and modern philosophy. Insofar as we know how to read the dialogues of Plato, we have learned that from Jacob Klein, which, of course, does not mean that when we become participants in what is happening in a given dialogue we necessarily agree with him as to what is going on at some given moment. He would expect us to argue our case as tenaciously and searchingly as he would argue his.

For nine years, from 1949 to 1958, he was Dean of St. John's College. As Dean he led the College to realize as it never had before the dream of Scott Buchanan. He was never one to be blind to faults and failures, and he knew very well that St. John's was far from being a perfect community of higher learning. But he knew what was good and even precious about St. John's and he embodied it in his own person

and his own work. May that person and that work live in our memory.

Douglas Allanbrook

Mr. Allanbrook played a composition, the fifth of Five Transcendental Studies, on which he was working at the time of Mr. Klein's death.

Robert S. Bart

Mr. Klein was a great man. We have occasion to speak often of the greatness of books, but rarely of the greatness of men. He was a great man, not only because, as Richard Scofield said, unlike all the rest of us, he possessed genius, but because he had a great soul.

He disliked even a hint of praise, not, I think, because he feared flattery, but because he always had better things to think of than himself. Nonetheless, perhaps he would not mind too much our thinking of him today. He himself thought a great deal about other people: he cared to understand them exactly. On the occasion when we met together like this to honor the memory of Victor Zuckerkandl, he spoke briefly but faithfully and vividly. Above all he hated what was pompous, inflated, sentimental. He had a distaste for the expression of feeling, perhaps because he was indeed passionate. Yet his mighty indignation rarely obscured his wonderful fairness. He was generous in judgment, liberal with his hospitality and his time. He was without pretense, though he always had many crotchets. As Mrs. Klein once said to me, and it was an extraordinary truth, he had no vanity. He must have turned upon himself that open, dark-eyed brilliant gaze, his light eyebrows slightly drawn together and curling upward in cheerful scepticism. He could lose himself better than any other man in order to enter into his passion for the College, for a text.

He was the most exciting of readers, and the best of teachers. In the course of his life he loved a vast variety of young people. He said once with utmost seriousness that the most beautiful sight in the world was the face of a young person learning. As a teacher he guarded the spontaneity of thought in those who would learn from him; he could be almost cruel to anyone who would be a disciple.

I knew him best when I was young myself, young enough to be disappointed that he was reluctant to talk about Plato at dinner, but young enough, too, to relish it when he and Mrs. Klein would tease one another, for all the world like Antony and Cleopatra.

Some of you have heard me tell the following anecdote before. But I know he would be glad that I should tell it now. A few years ago, on one of my by then rare visits to the house, I betrayed my interest in his writing by asking him what he was doing. Instantly he replied in indignation, "Studying. Studying." As if to ask, "What else would a man be doing who had any sense?"

The College

"Studying," he said. Let us then all honor him always by studying, studying the world, studying the books and the men and the women in it.

Robert G. Hazo '53

The year 1949 was a very long time ago, but I have no trouble at all recalling the original and enduring impression Jacob Klein made on me. His reverence for intellect was the central feature of his personality. He delighted in reason and design. In an age when humility was fashionable, he did not disguise the fact that he was a man of high intellectual pride. His artistry and dedication in the development of intellect were both obvious and acknowledged. He always managed, while many others failed, to say something important about something important. Using a language he learned only fairly late in his life, he spoke interestingly and compellingly to a wide variety of people, on an even wider variety of subjects, with a very high degree of success.

I, for example, as a devoted student of his for a very long time, and then later as an equally devoted friend, never had a serious conversation with him, studied any of his books, listened to any of his lectures, read any of his correspondence (or reflected on any of these experiences) without learning something. Since being called a real teacher is one of the best—and rarest—things that can be said of any man, saying it without qualification of the man we honor today is the best memorial I can offer him, and the one he would have most appreciated.

Jacob Klein was a man who, in an altogether extraordinary degree, understood what he was dealing with in the various phases of his life and encounters. He measured a whole panoply of changing events and confused situations in political life, in the public life of this College, and in the private lives of those who passed his way, with remarkable accuracy. His judgments regularly shed light where there had been darkness. His insights (for that is what they were, flashes of intellect rather than conclusions from labored syllogisms) were frequently of astounding excellence and authenticity. I have never met anyone before or since who, in dealing with both theoretical and human material, was able to bring so much order out of chaos.

I am not suggesting, through eulogistic exaggeration, the absence of error in his judgments. He understood very well how fallible human judgment is, and how sad it is to see it made subservient to rosy feeling or depression, to hopes or fears or, for that matter, any distorting emotion. The measures of his singular concern for the truth were his contempt for self-deception, in himself or others, the care with which he would draw a conclusion and, above all, his willingness to alter his views when he saw that they were not in harmony with reality. The example of his uncompromising intellectual integrity serves as a reminder of just how rare a real reverence for truth is, and also of how much discipline and courage are required to sustain it.

That consistent reverence for truth was, I am sure, behind

his many years of devoted service to St. John's. In a very real sense he was, for a very long time, its intellectual guardian. The result of what he accomplished through endless effort should, I believe, be recorded in high relief and given a foremost place in the annals of this College. I do not think it is any exaggeration to say that St. John's College would not be what it is—or perhaps not even be—were it not for what he did.

I loved Jasha Klein. My personal debt to him is measureless, but I loved him as much for what he was as for what he did for me. Those who were familiar with him know that his tact, his graciousness, his charm, his taste, his hospitality, his patience, his consideration for others, his unfailing sense of propriety, his constancy, and his courage set an example for all of us.

The love of truth is what guided his life and the stature, weight and elevation of his work showed again and again that there is no substitute for intelligence, particularly a trained and gracious intelligence. Through it he was able to see and signal the exceptional, the noble and the excellent amidst the commonplace, the mundane and the pedestrian. With exquisite artistry and care he caused wonder for the sake of learning. He had the sharpest eye for seeing the slightest mental glint or spark, and was nothing less than a genius in cultivating it, knowing that there is mixed with our mortal dust a precious fire to nourish.

I can never forget him. He was a very, very rare and special man. To find another like him I would take the brightest lantern on the brightest morning of the brightest day of the almanac and look and look and look.

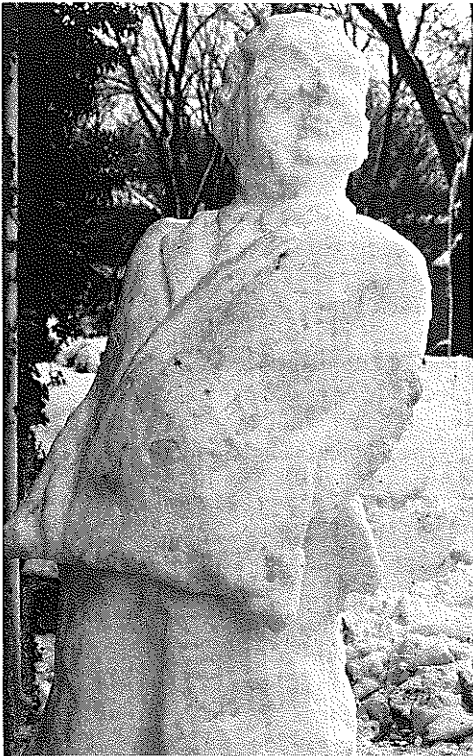
Barbara Dvorak Winiarski '55

I cannot speak about Mr. Klein directly, but must borrow words:

"You don't know about me, without you have read a book by the name of *The Adventures of Tom Sawyer*; but that ain't no matter. That book was made by Mr. Mark Twain, and he told the truth, mainly. There was things which he stretched, but mainly he told the truth. That is nothing. I never seen anybody but lied, one time or another, without it was Aunt Polly, or the widow, or maybe Mary. Aunt Polly—Tom's Aunt Polly, she is—and Mary, and the Widow Douglas is all told about in that book—which is mostly a true book; with some stretchers, as I said before.

"Now the way that the book winds up is this: Tom and me found the money that the robbers hid in the cave, and it made us rich. We got six thousand dollars apiece—all gold. It was an awful sight of money when it was piled up. Well, Judge Thatcher, he took it and put it out at interest, and it fetched us a dollar a day apiece all the year round—more than a body could tell what to do with. The Widow Douglas she took me for her son, and allowed she would civilize

me; but it was rough living in the house all the time, considering how regular and decent the widow was in all her ways; and so when I couldn't stand it no longer I lit out. I got into my old rags and my sugar-hogshead again, and was free and satisfied. But Tom Sawyer he hunted me up and said he was going to start a band of robbers, and I might join if I would go back to the widow and be respectable. So I went back."



A student tribute to Dean Klein, before 1958 —with a perhaps inadvertent recall of Rodin's *Balzac*.

Eventually, of course, Huck becomes to some extent civilized. Not civilized according to the standards of the town of Hannibal, but perhaps more truly civilized than Hannibal ever dreamed of. And, in reading about his "civilizing"—the first time he is required to live according to decent standards and to attend school—we learn about the important differences between the Widow Douglas and Miss Watson, her sister.

Miss Watson, "a tolerable slim old maid," was, of course, very civilized by Hannibal standards. She was ideally suited to teach Sunday School, with all the unfortunate limitations therein implied. She was just about perfect at imposing restrictions.

The Widow Douglas, on the other hand, would not have done to teach Sunday School in Hannibal. She had, we infer, a larger acquaintance with the world, that escaped Hannibal as a general thing. She had also a faintly raffish air that, had her ties with respectability been less substantial, Hannibal would have regarded as not quite nice . . . not to say dangerous.

Beyond all this, she is, I think, in all of *Tom Sawyer* and all of *Huckleberry Finn*, the one adult who combines *being civilized* with *being interesting*. And she is, perhaps not incidentally, the naturally kindest, most generous adult in both novels.

Now, about Huck. He was an outcast, a friendless soul, worse than an orphan because he was tied to his natural, still-living father. The first person Huck is attracted to in Hannibal is Tom Sawyer—the only artist in town. Tom is the first person Huck knows who passes on something of the larger civilization—beyond Hannibal, beyond the Americas even—who passes on his knowledge in an inviting, a palatable, a digestible way.

But Tom, being an artist, is not reliable. And Huck somehow perceives that Tom can't be relied upon in his fireworks of gorgeous information.

In addition to being an artist, Tom is a hero; and Huck is his natural and innocent accomplice, not to say foil, within limits, with the result that Huck becomes a hero in his turn. As such, he is brought to the attention of the authorities. The final result is that the widow—a more substantial vessel than Tom—undertakes to civilize Huck, and succeeds in doing so more than anyone else can do.

Mr. Klein had a very good eye for the Huckleberrys of the world. In turn, the Huckleberrys generally came to be very fond of him; and, by his means, came to submit to restrictions and demands which would have been unthinkable when suggested by the Miss Watsons.

Because of him, we managed to get to class long enough so that the classes eventually got to us. Eventually, even we became subject to the power of discourse, which Mr. Klein once called "this marvel . . . this greatest marvel perhaps under the sun."

Elliott Zuckerman

I wish I had been able to consult Jasha about this speech. He always knew precisely what to say on these occasions. He would have told me whether the sentiments were appropriate. He might have objected to certain words; and I would then have known that those words had to be strictly scrutinized, and probably replaced.

Our friendship, indeed, was in large part based upon an interest in words. He would be indignant when they were mispronounced—and it was a joke we shared that my instinct for accenting Russian names on the wrong syllable was almost as unfailing as that of the news broadcasters he listened to every evening. Far more important was his objection to certain words even when they were pronounced correctly. It is well known that in his final years there were words that, regardless of the context, could not be used safely in his presence. At lectures, for example, he would respond to those words as though they were blemishes on the texture of the discourse. Behind this categorical rejection there lay, of

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course, the most serious concern for meaning, particularly for uncovering those unexamined misconceptions that creep in attendant upon the favorite terms of philosophical jargon. I learned from him how certain words—'reality', for example, and 'mind'—may have implications that vitiate the arguments in which they are embedded.

He could have had no better justification than that he wrote so precisely himself. In the most immediate way, to be precise was to be good. Before I knew him, I had known some very articulate people. But for the most part they contented themselves with saying what they had already discovered to be easily sayable. Or they were so proud of their articulateness that they had little concern for whether what they said *ought* to be said. Jasha, in contrast, could succeed in saying with simplicity the most profound and difficult



Mr. & Mrs. Klein
with the physicist,
Werner Ehrenberg,
about 1951.

things. And he did so without ever deceiving us into thinking that those things had been easily arrived at or easily understood. Contained in his sentences is the acknowledgment that it is the simplest things, such as Being itself, that few of us ever even begin to wonder about. Hence his prose could sometimes achieve what all teachers ought to consider their highest task, which is to nurture some glimmer of that wonder.

He could also write *beautifully*, as in those passages of hard-won simplicity. And he did so in a language which, according to a favorite anecdote, he didn't, when he was a young man, think he'd ever have to use. He was not concerned with the superficial decorativeness of the sound of words, and not usually with the mere charm of a metaphor. I remember that once, when he was visiting me in Santa Fe, we had a rare talk about poetry. I had just begun to see, as I think the *Ion* requires of us, that one's love of poetry is scarcely earned until one has entertained the possibility that we are being deeply deceived by even the greatest poetry—I should say *especially* the greatest. In the discussion I was reluctant to think of Homer or Shakespeare as deceptive. I recall that Jasha alluded to a kind of poetry that could be called Philosophical. I did not understand then, and I still don't

understand, how one could tell whether poetry was of the philosophical sort or the sort that misleads. The most obvious interpretation was that he wanted to place in a special category those aspects of the Platonic dialogues that are dramatic, or mimetic, or metaphorical, or mythical. But I wonder now whether both the words philosophical and poetic couldn't also be applied to those passages of his own in which difficult things are said simply, and in which the understatement leaves space for the beginning of wonder.

The sound of those passages is that of spoken words. When I first arrived here, Jasha was engaged in reading the manuscript of the *Meno* book to his friends. I was too new to be among them. But fifteen years later it happened to be to me alone that he read, twice through, the manuscript of the book called *Plato's Trilogy*. As a kind of preliminary editor, it would have been easier for me to *see* the manuscript—and eventually, of course, I did have to look at it. It turned out that I wasn't very much needed as an adjuster of pronouns and commas. It was as *listener* that he wanted me to serve, for it was the teacher who was speaking. And in the months since he died I realize how much I miss the sound of his voice—as I heard it in the long periods of his last readings, as I heard it in those brief and clear questions he asked on the telephone, as I heard it in words of advice and encouragement.

But more than the speech I shall miss the silence. Even more than the words, the silences were eloquent. I remember that five years ago, when I was ill and he was elderly, he visited me almost daily. There was little to say that was new or amusing, but his presence alone was touching. In his final months, when he sometimes confined himself to his upstairs room, I could, in return, visit him. There was no manuscript to read, and by then he seemed to have lost interest in what was happening at the College, or in the world. I sat there in silence while he silently rested. He would break the silence only to thank me for being there. We both knew that one thing we could never share was the love for music. But now I think of those silences as a kind of music—or, to say it more daringly, as the sort of stillness that must be the ultimate aim of even that music that moves the most.

Jacob Klein was never formally my teacher or officially my dean. I knew him best in his years of waning activity—the same years which have so far counted as the second half of my adult life. I heard the stories of his thoughtful and worldly early years, of his importance as a scholar, of his inspiration as a teacher, of his strength as dean—and some of the qualities that marked those eras were still remarkably present up until almost the very end. The true end of his life—the *telos*, which is, as he often said when talking about Aristotle, the beginning—that end is still alive in the people he has taught and those whom they in turn shall teach. But he was not allowed to die as Socrates died. There was a brief and final decline that preceded the ending of his life. It was difficult to watch, and until very recently I found it hard to find my way behind the mask of death. Yet at the same time I feel that there was a certain privilege in witnessing the end. What that is I find it hard to articulate. Part of it was to notice the echoes and reminders of his wisdom and his humanity. But

perhaps my sense of privilege has to do with something I learned mostly from Jasha himself: that one must try to see things in their wholeness. Right now the final days seem mysterious to me. I still feel haunted by them, and I feel bereft.

Eva T. H. Brann

A memorial meeting such as this, which is intended at once to confirm and to foil a death, seems the proper occasion for careful and clear-eyed recollection of the man we have lost.

He was, first and last, every inch a teacher, a teacher who stymied discipleship in the very effort to induce learning. He did, indeed, have some teachings to convey—a few, though those were powerful and of large consequence; above all, the understanding of the arithmetic structure of being set out in his book on the origin of algebra.

But these doctrines, central as they were, were obvious; obvious, that is, once they had been told. It is doubtful that they would have been soon discovered without him. As they went home in their obviousness, they displayed their originality. They were not cleverly fabricated by reference to the opinions of others, but direct and deep. As they were original, they were faithful, faithful to the text of which they were interpretations.

For he spent his most characteristic effort in recovering the way to the conversations of that most artfully communicative lover of wisdom whom he followed. Yet as his readings were faithful, they were fresh, as immediately the thought of Jacob Klein as of Socrates.

His way into the dialogues was emphatically not a method. He insisted that each had to be approached in its own terms. But as he shunned unthinking method, he practiced unfailing meticulousness. His manuscripts, written in a small, fine hand, were thickly annotated with precise references to the text. Nonetheless, for all this carefulness, he was blithe to cut sweeping swaths through the blind thickets of scholarship.

In sum, his learning was at once inimitable and influential for the reason that it did no more and no less than rouse a sort of recollection. I often ask myself whether I learned anything or everything from him.

He was solid; he possessed himself what in his commentary on the *Meno* he called a solid soul, that is to say, a soul with dimensions enough for inward depth. Yet as he was solid he was plain and also playful, inventive in the explanatory and evocative devices of the talented teacher.

He preserved the humaneness of his energy by reserving it for a small community, for this college; he chose this life in accord with the verse of the *Preacher* spoken on a mellow Maryland summer day at his grave site, as close as could be to our campus: The words of the wise man are heard in quiet more than the cry of him that ruleth among fools.

In behalf of his school he was fiercely parochial, though by personal and political fate the complete cosmopolitan, a wanderer who in spirit never gave up his Nansen passport, determinedly unrooted. And yet he achieved a home, the most



Jacob Klein about the age of 6 in Russia with grandparents.

comfortable and animated, hospitable and private domesticity anyone could wish for.

He was fully free from his own time, but as he was free of it, he was a most knowledgeable contemporary, a passionate bystander who listened to the hourly news as one appointed to be the world's monitor. As his world was large, he cherished immobility and its accumulations. His study was the repository of sacrosanct piles of undusted and outdated documents. He was altogether an indoor man, who would take the car from Market Street to campus, but he was light and supple, and could break into a sudden caper. In looks he was at once small and grand, soft and manly; in bearing he could be excitedly mobile and regally dignified.

He lived a life bare of all esthetic paraphernalia, but he was the most sensually appreciative of men, not least, of all the pleasures of the table. Caught off guard, he would admit that he had no ear for music, but he loved epic poetry, especially the spacious warmth of Russian novels. He spoke English with a soft, gravelly Russian accent, and he wrote it in a strong, sound style. As his life's preoccupation was the wonder of the word, so he battled with ever-fresh fury its smart and thoughtless perversions.

In the small world he had chosen he was ubiquitous. As dean he would station himself at the bottom of the McDowell stairs to take the pulse of the place. Yet he was devoid of all intrusive curiosity and his gossip was without smallness. He suffered his own fools gladly and met youthful contentiousness with sweet serenity, but he could be royally irascible with incompetent meddlers.

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He came conveniently equipped with those eccentricities—he called them his pathologies—which are the joy of student communities, and he was balanced and sane—the Greeks would say, sound-minded—above anyone; he was harmonious in his oppositions.

He could be shamelessly affected by others' grief, and he could be stonily unforgiving when the bounds had been overstepped. He was coolly reserved in the face of pretentious impertinence, but his usual way was the warmest, most irresistible pedagogic eros.

And finally, he was in birth and in appearance unmistakably a Jew, but his soul belonged to that unending enterprise which has its origins among the Greeks.

He was a man, take him for all in all, we shall not see his like again.

* * * * *

In conclusion Mr. Weigle read Miss Eva Brann's and Brother Robert Smith's tribute to Jacob Klein, adopted by the faculty on September 6, 1978:

All students who had the good fortune of being in his classes remember him as the best of teachers. All members of the College felt the inspiration of his wise guidance. None can forget the depth of his intellect, his passion for learning, his love for the young, and his care for his colleagues. He wrote three books: *Greek Mathematics and the Origin of Algebra*, *A Commentary on Plato's Meno*, and *Plato's Trilogy*, as well as many essays and lectures. But for him philosophy was never so much a matter of books as a living conversation. In his modesty he would have refused a comparison which the whole community felt: that he was, like Socrates, able to elicit from his friends truths beyond their own expectations.

An Unspoken Prologue to a Public Lecture at St. John's

by Leo Strauss

The common sense of mankind has granted old men certain privileges in order to compensate them for the infirmities of old age or to make it easier for them to indulge those infirmities. Not the least of these privileges is the permission granted to old men to speak about themselves in public more freely than young men can in propriety do. I have always regarded it as both an honor and a pleasure to come to St. John's to lecture and to meet faculty members and students. But I also had a private reason for enjoying my journeys to St. John's. St. John's harbors—it is a perfect harbor for—my oldest friend, Jacob Klein. Permit me to pay homage to Mr. Klein on the present occasion, the first occasion after his sixtieth birthday. What I intend to do I regard as an act of duty,

although of a pleasant duty. Yet however innocent our actions may be as regards their intentions, the circumstances in which they are performed may cloak those actions with an appearance of malice. In such a situation one must not be squeamish and still do one's duty. In addition—such is the complexity of the things of the heart—even if we are virtuous men, we may derive some pleasure from the appearance of malice, provided we keep within certain bounds. In the present case the appearance of malice arises from Mr. Klein's idiosyncratic abhorrence of publicity—of anything which even remotely reminds of the limelight. I always found that Mr. Klein went somewhat too far in this but all too justified abhorrence. When we were in our twenties we worked every day during a longish period for some hours in the Prussian State Library in Berlin, and we relaxed from our work in a coffee house close by the Library. There we sat together for many hours with a number of other young men and talked about everything which came to our mind—mixing gravity

Leo Strauss sent this statement to Jacob Klein on April 7, 1960. Published by the kind permission of the Executor of the Estate of Leo Strauss.



Klein (upper left) in Marburg, 1923? 1924? The man in the center with his right hand up to the side of his face is Nikolai Hartmann, Professor of Philosophy at Marburg. Hartmann played a major part in bringing Heidegger to Marburg about this time.

and levity in the proportion in which youth is likely to mix them. As far as Mr. Klein was concerned, there was, I am tempted to say, only one limit: we must not appear to the public as young men cultivating their minds; let us avoid at all costs—this was his silent maxim—the appearance that we are anything other than idle and inefficient young men of business or of the lucrative professions or any other kind of drones. On such occasions I derived enjoyment from suddenly exclaiming as loudly as I could, say, “Nietzsche!” and from watching the anticipated wincing of Mr. Klein.

Nothing affected us as profoundly in the years in which our minds took their lasting directions as the thought of Heidegger. This is not the place for speaking of that thought and its effects in general. Only this much must be said: Heidegger, who surpasses in speculative intelligence all his contemporaries and is at the same time intellectually the counterpart of what Hitler was politically, attempts to go a way not yet trodden by anyone, or rather to think in a way in which philosophers at any rate have never thought before. Certain it is that no one has questioned the premises of philosophy as radically as Heidegger. While everyone else in the young generation who had ears to hear was either completely overwhelmed by Heidegger, or else, having been almost completely overwhelmed by him, engaged in well-intentioned but ineffective rear-guard actions against him, Klein alone saw why Heidegger is truly important: by uprooting and not simply rejecting the tradition of philosophy, he made it possible for the first time after many centuries—one hesitates to say how many—to see the roots of the tradition as they are and thus perhaps to know what so many merely believe, that those roots are the only natural and healthy roots. Superficially or sociologically speaking, Heidegger was the first great German philosopher who was a Catholic by origin and by training; he thus had from the outset a pre-modern familiarity with Aristotle; he thus was protected against the danger of trying to modernize Aristotle. But as a philosopher Heidegger was not a Christian: he thus was not tempted to understand Aristotle in the light of Thomas Aquinas. Above all, his intention was to uproot Aristotle: he thus was compelled to disinter the roots, to bring them to light, to look at them with wonder. Klein was the

first to understand the possibility which Heidegger had opened without intending it: the possibility of a genuine return to classical philosophy, to the philosophy of Aristotle and of Plato, a return with open eyes and in full clarity about the infinite difficulties which it entails. He turned to the study of classical philosophy with a devotion and a love of toil, a penetration and an intelligence, an intellectual probity and a sobriety in which no contemporary equals him. Out of that study grew his work which bears the title “Greek Logistics and the Genesis of Algebra.” No title could be less expressive of a man’s individuality and even of a man’s intention; and yet if one knows Klein, the title expresses perfectly his individuality, his idiosyncrasy mentioned before. The work is much more than a historical study. But even if we take it as a purely historical work, there is not, in my opinion, a contemporary work in the history of philosophy or science or in “the history of ideas” generally speaking which in intrinsic worth comes within hailing distance of it. Not indeed a proof but a sign of this is the fact that less than half a dozen people seem to have read it, if the inference from the number of references to it is valid. Any other man would justly be blamed for misanthropy, if he did not take care that such a contribution does not remain inaccessible to everyone who does not happen to come across volume III of section B of “*Quellen und Studien zur Geschichte der Mathematik, Astronomie und Physik*” and in addition does not read German with some fluency. One cannot blame Klein because he is excused by his idiosyncrasy. I hope that you, faculty and students of St. John’s, do not accuse me of trespassing if I say: some man or body of men among you should compel Klein, if need be by starving him into submission, to close his eyes while you arrange for a decent English translation and its publication. The necessity for this is in no way diminished by the fact that Mr. Klein is said to prepare now a new book which may contain a very long footnote giving the first intelligent account of the Platonic dialogue and which will probably be entitled *Mathematics in the Curriculum of the School of Gorgias*. But it was not in order to make to you the foregoing suggestion that I made these prefatory remarks: I ask you to rise and join me in giving Mr. Klein an ovation.

About Jacob Klein's Books About Plato*

by William O'Grady

The best human being Plato knew or could imagine spent his life thinking and conversing and wrote nothing down. Plato himself made more than thirty thought-things which have endured and become part of the world. Of these writings Plato wrote (*Second Letter*) that they are not his, but rather belong to "Socrates who has become new and beautiful". The *Dialogues* exist when Socrates becomes new and beautiful, that is, when under his inspiration living conversation comes to be. The *Dialogues* exist fully only when they pass away as written works. But first they must be encountered as written works, as made things, wholes with parts, dramas with decisive moments. Jacob Klein's two books about Plato, *A Commentary on Plato's Meno* and *Plato's Trilogy*, help us more than any other books I know, both to encounter the *Dialogues* as made things and to remember that living speech—conversation between people who are trying to understand important matters—is better, more truthful, than anything that can be written down. That they are so helpful has many causes, but one of them is a certain clarity about the wrongness of trying to do in writing what can be done truthfully only in living speech.

By this I mean that the great insights in his books—which are simple, definite and, I think, undeniable, though very few of us, if any, would have come to them without his help—are emphatically not conclusions or solutions: they settle nothing. Rather they are beginnings, at once secure and exciting, of a wondering reflection that requires to be worked out in endless conversation. By taking the dialogues seriously as made things, by noticing, counting, remembering, checking, comparing, and being ready to smile, he is able to make sense of much in them that is otherwise merely baffling and even tedious. But he does not clear up what we were wondering about. Rather our wonder is educated, directed to where

it will do the most good, provided with simple and direct words so that the question to be faced is distorted as little as may be.

I shall give three examples from the *Meno* book. First, the dependence of image upon original is the model proposed by Plato for trying to understand the relation of visible and tangible beings to beings in speech and thought. Second, the slave boy questioned by Socrates has a choice in answering but the choice is not between "yes" and "no"; rather it is between answering in submission to the necessity inherent in the matter itself and revealed by his thinking, and answering "personally", that is, in a way determined by the memories, desires, hopes and fears that are uniquely his. Third, in order to understand "recollection" as a descent of the soul into itself beyond memory (the *ana* of *anamnēsis* and *analabein* indicating "up" as well as "again"), one must be able to speak unapologetically of the depth of souls, so that the likely story of the *Timaeus* attempts to show that "depth", a "third dimension", is somehow intelligible as prior to body: to speak of souls having depth is no more metaphorical, no more derivative, than speaking of bodies having depth. Such insights as these clearly cannot become part of a system; but to have made them, in some measure, one's own, is to have learned something unforgettable about what is truly worthy of wonder, and of discussion.

What is true of the *Meno* book is true of *Plato's Trilogy*. In the *Theatetus*, *Sophist* and *Statesman* (with the *Parmenides* somehow present), it could appear that we are concerned not so much with the being of the learning soul, as in the *Meno*, but rather with the ruling beginnings or sources of Being itself. But this appearance is somewhat deceptive. For although it turns out that there is evidence, beautifully assembled by Mr. Klein, that Aristotle was right in saying that Plato posited two ruling beginnings (how after all could Aristotle have been wrong?—Mr. Klein must have spent a great deal of time imagining what it was like when Plato and Aristotle talked together, as they did for twenty years), the remarkable fact is that Plato called these ruling beginnings by a variety of

*Jacob Klein, *A Commentary on Plato's Meno* (Chapel Hill: University of North Carolina Press, 1965).

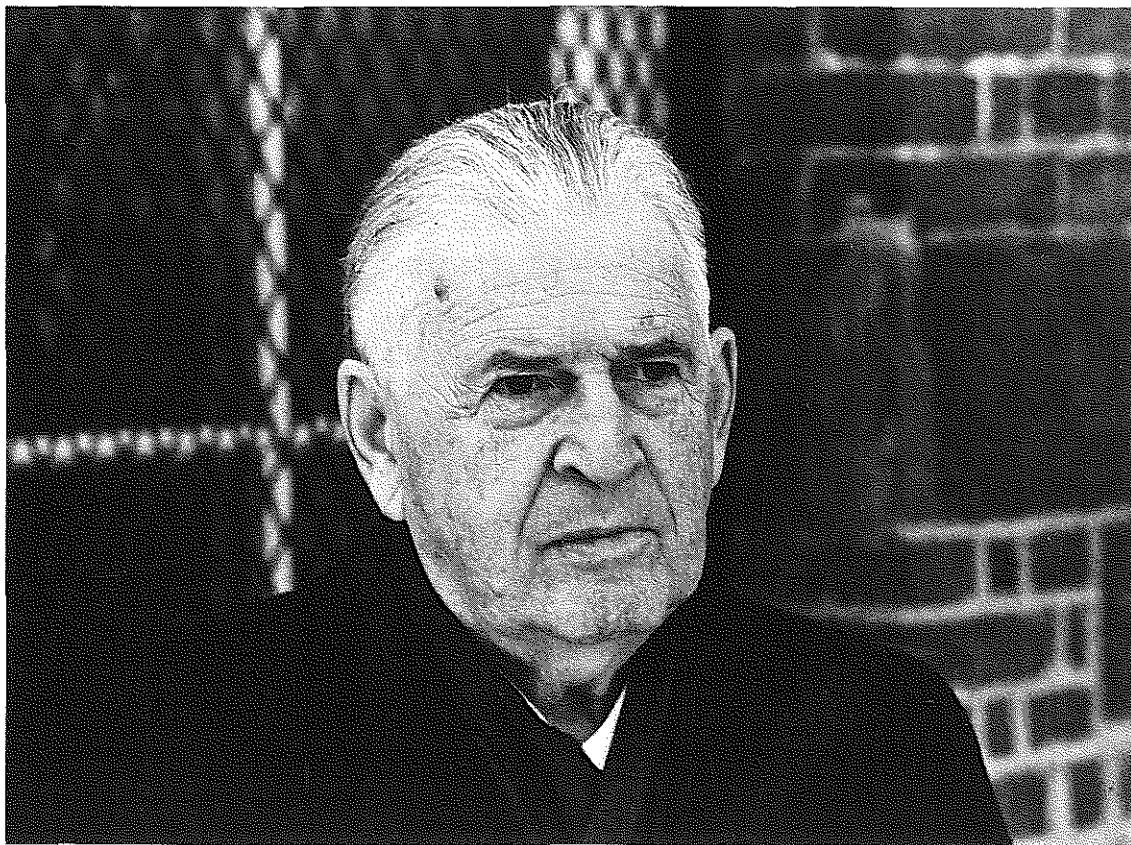
—, *Plato's Trilogy* (Chicago: University of Chicago Press, 1977).

names. For one of the two sources "beyond Being" he used the names: the Good, the One, the Same, the Limit and the Precise itself. "Which of these words is chosen depends upon the context in which it is used" (p. 174). For example, in the *Statesman* the context is provided by "the faultiness and imprecision that pervades the conversation." "Why is there so much stress on faultiness and inaccuracy in the drama of the dialogue? Is it not because the theme of statesmanship requires it? There is nothing that imposes a greater burden on human lives than faulty statesmanship, and no greater fault than that which occurs in governing states" (p. 161).

Thus the context is always determined by the particular inquiry of the learning soul. Because it is a learning soul, it cannot say that one of these contexts is simply prior to the others, hence that one name is most revealing. It is far too much in the middle of things to be able to do that. That is

why, although for Plato "at any time of his adult life" (p. 6) as much as for Aristotle, *the question* is the question concerning Being, for Plato there can be no systematic metaphysics. Mr. Klein's great thought is that the question concerning Being is inseparable, not from the question concerning soul in general (still less, of course, from the question concerning the Transcendental I), but from the question concerning the learning soul.

What the learning soul might be shows itself as now Meno, now the slave boy, now we ourselves, respond to the injunction to make an attempt, to try to "recollect", to try to think "impersonally" about the question we face rather than being dominated by the "menonic" memory of which "all of us have a share" (*Meno* book, p. 188). The response to this injunction is an utterly personal matter, and in it human excellence is at stake and Being somehow comes to light.



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