V. EDUCATION IN POSTMODERN TIMES

I have to begin by saying that the title of this lecture promises too much. It suggests that there will be a more or less exhaustive treatment of education in our days. That is, of course, impossible; it would require far more than a single lecture. My goal is more modest. It is, firstly, to provide an overview of some of the more obvious postmodernist approaches to education; secondly, to explain these approaches; and thirdly, to suggest ways of dealing with curriculum content that make it possible for us to confront the new world-view in our teaching. The stress will be in this third part on academic content in the traditional school subjects, and on integrated approaches to the teaching of these subjects. I will conclude by attempting to answer the question what knowledge is, for Christians, of most worth.

1. Postmodernism and education

Contents and goals at the university level

A good way to introduce the first part is by turning to a booklet on postmodern education that has received much attention in recent years. I am referring to Jean-François Lyotard's study *The Postmodern Condition*, which saw the light in 1979. I have mentioned this booklet in the general lectures, where I gave special attention to Lyotard's definition of postmodernism as 'incredulity toward metanarratives.' In this paper we will concentrate not first of all on his ideas on metararratives, but on his thoughts on education, although, as we will notice, the two cannot be fully separated.

Lyotard begins by saying that the status of knowledge changed when societies entered the post-industrial age and cultures the postmodern one. Among the reasons for the change was the fact that the old metanarratives were being abandoned. By metanarratives (or master narratives or grand stories) Lyotard thinks, as we noted earlier, of traditions and systems of beliefs that legitimate knowledge. Christianity, for example, provides such a metanarrative. It tells believers that truth exists, how and where it can be found, why it should be pursued, and what knowledge is of most worth. Modern science, according to Lyotard, provided two metanarratives. One was that knowledge served the 'training of the mind' and therefore was an end in itself; the other that it was a means to progress and human emancipation.

The postmodern age, Lyotard says, no longer believes in these master narratives. It has a more practical orientation toward knowledge than modernism had. Knowledge is now produced not for any idealistic goal, but simply in order to be sold and consumed. This applies of course especially to scientific and technological knowledge, which is of value in the world-wide market. Lyotard stresses the global perspective throughout. He believes that some day nations may fight for the control of information just as previously they fought for the control of territory, raw materials, investment opportunities, and cheap labour. For today it is knowledge, especially information, that is all-important. As Lyotard says, it provides fields for industrial and commercial strategies on the one hand, and for political and military ones on the other.

When dealing with educational changes in the postmodern era, Lyotard concentrates on university education, but his prescriptions have a bearing on elementary and secondary schooling as well. Education, Lyotard says, must become pragmatic, which means that it must concentrate on the creation of skills rather than on ideas. There are two overriding goals that universities have to keep in mind. Firstly, education must equip the nation to tackle world competition, and secondly, it must help guarantee society's internal cohesion. In other words, the country must not only do well economically, it must also be governable. These goals suggest that the emphasis will be on mathematics, the natural sciences, technology, cybernetics, business administration, management training, and on such social sciences as economics, politics, and sociology. It means that there will be a sharp distinction between what Lyotard calls professional training on the one hand, and training in the arts and the humanities on the other. Professional training will produce the technological and professional intelligentsia; training in the arts and humanities will produce people who, Lyotard says, are actually unemployable and will need retraining.

You may think that these people could at least join the teaching profession, but Lyotard does not believe that that will be the case, for the demand for professors will decline. The grand narratives which legitimated knowledge in the olden days needed human teachers: the story had to be transmitted to every new generation. But these metanarratives are now irrelevant. Knowledge under postmodernism has nothing to do with such fine goals as the building of the mind or the emancipation of the citizen. Knowledge is simply power. *Performativity* (to use a typical postmod-

ernist term) is what counts, which means that knowledge must be usable and saleable. And with the availability of data banks and so on, machines can take care of this type of training.

At least, they can do so up to a point. Lyotard admits that information is not everything. It must be arranged, and therefore the human imagination remains important. For that reason educational institutions cannot be satisfied with producing only information and skills; they must also train people to see connections. That type of training will require interdisciplinary studies, and here human instructors will be needed. Lyotard does not go into any details as to the types of subject areas that will be considered relevant in this field. He does tell us that these studies will not be taught by the lonely professor, as was the case traditionally, but by groups of instructors. Interdisciplinary teams, computers and databanks will replace the type of professor we knew under modernism.

Contents and goals for the schools

In the previous lecture I described the postmodernist approach to education in elementary and secondary schools. Those who have followed the description will have noted that Lyotard's ideas are similar to those of educational policy-makers. The stress in the schools also is increasingly on interdisciplinary studies (all sorts of subjects are brought together into one 'core' programme), on the teaching of skills, and, in connection therewith, on performance, rather than on knowledge for its own sake.

As I also pointed out in the previous lecture, there are differences as well. More so than Lyotard, Ministries of Education have to ensure that all students stay in school and that in the end all will be employable. For unemployment tends to be high among young people, especially among those who are insufficiently trained, and this can lead to serious social and political problems. To avoid these problems, schools are told to see to it that students are properly socialized, and also that they are assured of success in school, so that they do not 'drop out.' Among the means to achieve these goals are, firstly, the teaching of a variety of life, social, and career skills, and secondly, a policy aimed at ensuring equality not only of opportunity but also of outcome. This implies in most cases a downgrading of the curriculum, so that all students can make the grade. Training in skills is stressed at the expense of academic content, and equality at the expense of academic excellence.

In connection with the desire for equality of outcome quite a bit of attention has been given in recent years to the idea of Outcome-Based Education (OBE), as it has been worked out by the American sociologist William Spady. Like most contemporary educational leaders, Spady wants the schools to produce well-socialized consumers and well-trained, flexible and adaptable producers. To accomplish these goals he assigns only a secondary role to the traditional curriculum, and he bases evaluation not on the students' knowledge of academic content as such. Content is not neglected but (if I understand him correctly) it is given in large part for the sake of skills, so that it does not matter all that much what content is taught. In any event, his evaluation is based not on knowledge per se but on the students' having mastered what he calls Complex Life Performance Roles.[48]

By this term Spady refers to the skills and attitudes necessary for students to play their proper role in the society and market place of the future. Spady's Complex Life Performance Roles are vague and general enough for teachers to pass all students, even though some may have to spend more time in school than others. But whatever their ability, the stress is not, Spady insists, on what students know, but on what they can do when they exit the school system. Performance, rather than knowledge per se, is the desired outcome. And this system, some of Spady's followers assure us, will bring about great social improvements. Unemployment, poverty, illiteracy and crime will diminish and perhaps disappear altogether.

Why the switch to skills?

The switch from content to skills is inspired in part (but only in part) by pragmatic reasons. In the foregoing I have already touched upon these reasons. They are weighty ones. All students, also those who are not at all academically inclined, have to be prepared for the challenges of the ever-changing national and global economies of our post-industrial society. That means that they must at the very least complete their secondary education and learn the proper skills to function in the post-industrial market place. This is, as any educator knows, a formidable assignment, and I do not underestimate the problems that governments and schools face in these respects.

In addition to these pragmatic reasons there are philosophical ones, which concern the demand for equality. The educational establish-

ment has long been dominated by people anxious to promote equality, and it began to downgrade the curriculum well before postmodernism became fashionable. Postmodernist educationists are generally of the same 'progressive' persuasion as their late-modern counterparts, and that persuasion plays a role in their educational policies.

Another important factor – one that we will be especially concerned with in this lecture – is the changing attitude toward knowledge and truth. The postmodernist denial of truth implies, as we already heard from Lyotard, that the only knowledge worth having is that which can be used and consumed, bought and sold. Ideas are not important; skills are what counts. The question why this is so must now have our attention.

2. Postmodern disbelief in truth

The denial of truth is at the core of our culture. Scepticism and relativism were certainly not absent under modernism, but they were not nearly as pervasive as they are today. Modernism believed that at least some truths — scientific ones, for example — could be discovered. Postmodernism denies this. Truths are made, not discovered, and *universal* truth does not exist.

In the previous lectures I have dealt with some of the causes of postmodernist relativism and scepticism. Before enlarging on the topic, let me briefly recapitulate. One reason for the general disbelief in truth, we noted at the time, is the disillusionment with the performance of modernism. Another factor is the teaching of late-modern thinkers like Karl Marx, Friedrich Nietzsche, and Sigmund Freud, who taught that we don't really mean what we say or write. We wear a mask and engage in the telling of idealistic stories in order to hide the fact that we are really after gain, or power, or the gratification of other desires. These teachings have influenced those postmodernist literary theories that became known under the generic name of the new hermeneutics.

A third factor I mentioned is the contribution of modern philosophies of language and modern linguistics, which teach that our view of reality is unreliable because it is determined by the language of our society, that is by its vocabulary, its grammar, the inherited metaphors, and so on. If we had a different language, and if our ancestors had invented a different grammar and chosen to use different metaphors, we would have a different view of reality.

The use of metaphor

In connection with language I want to refer briefly to the postmodern scrutiny of the use of metaphor, a topic we did not deal with in the general lectures. Metaphor is a figure of speech whereby we speak about one thing in terms suggestive of another. It is used for adornment but also, and especially, in order to enlarge our understanding, and to make clear that which cannot be explained in literal language. The Bible, for example, makes use of metaphor in order to tell us about God. It speaks of Him in such terms as father, shepherd, husband, and rock. Jesus too calls Himself a shepherd. He also refers to Himself as the door, the way, the true vine, and the bread of life. That does not mean, of course, that He is a literal door or vine, any more than that God is literally a rock or a husband. Metaphors are used to express what cannot be expressed, or what cannot be expressed as well, in non-pictorial language. In theology and other areas it speaks to us of what has been called the 'mysterious overplus.'[49]

Metaphors are used in non-religious language as well. We use military metaphors, like fighting the good fight, disarming our opponent, and laying down our weapons. We also describe the universe metaphorically when we call it an organism or a clock work or a machine. I chose these examples to show that modern linguists are right when they say that the choice of metaphor can strongly influence our view of things. It makes all the difference in our view of nature, and therefore also in our attitude toward technology and the environment, whether we see the universe as a living organism or as a dead thing like a machine. It also makes all the difference whether we speak of God as father and shepherd, or in terms of a far-away deity, who is not involved with His creation. In short, metaphors influence the way in which we conceive of God and man and nature. They influence our world-view. Different metaphors would have given us an altogether different view. And this goes to show, postmodernists say, that we are indeed imprisoned in the language that our society has produced.

As I have said before, there is truth in the postmodern position on language, and we must respond seriously to it by constantly evaluating our linguistic usage. Let us briefly do this with respect to metaphor. Biblical metaphors are means by which God has chosen to make Himself known to us. They are therefore normative. But that is not the case with man-made metaphors. Here we indeed have to be careful, for it is easy to

see a metaphor as the one and only gateway to reality. This happened with the modern machine model of the universe (for a scientific model is in a sense an extended metaphor). It can happen with postmodernist models as well. Our language about nature and science must be constantly scrutinized. We should not uncritically follow the postmodern way of speaking about nature, but neither should we be satisfied to adhere, without further ado and simply because we have lived with it for some centuries, to the modern mechanistic one.

Another thing to be kept in mind is that metaphors both enlarge and restrict our understanding. As to the enlargement, what applies to pictures applies to metaphors: they can be worth a thousand words. The machine model of the universe, for example, has enabled scientists to understand much more about the universe than the old organic one did. It suggested realities that could not be observed, and allowed for thought experiments that often proved extraordinarily fruitful. That is one part of the story. The other part is that for a long time it also prevented scientists, and the populace at large, from seeing whatever did not fit the model. All things, including the human, were perceived as a machine and only as a machine.

What the postmodern scrutiny of language should teach us is that we must not allow ourselves to be imprisoned by one dominant metaphor but be open to several different ones. This means that we should indeed see the universe, and even the human body, as a machine, for in many ways they operate in that way. But we should not think of them solely in mechanical terms. That is reductionistic, which means that it reduces the object of our investigation to the lowest constituents. Nature — to limit ourselves to that — should be perceived as organic as well. Not in the last place, it should be seen as God's creation, a creation that He gave to man so that man might develop it and care for it.

The use of a variety of descriptions, including metaphors, will help us in other ways to escape the reductionisms of modernism. To give an additional example, water should not be explained only in chemical terms as H_20. It is also the rain that refreshes the land, the cool drink that quenches thirst, the rivers and waterfalls that show us the beauty of creation, and the means whereby God, in the sacrament of baptism, signs and seals His covenant. In brief, it is not a matter of either-or, it is one of both-and.[50] The Bible makes that very clear. God uses a great many metaphors to make Himself known to us. He speaks of Himself as father, shepherd, bridegroom, and friend, but also as the King of kings and the

righteous Judge, and as the Eternal One, who dwells in an unapproachable light. We go wrong if we stress one metaphor or type of metaphor at the expense of another. Here, then, we have another answer to the view of metaphor as a prison.

Developments in mathematics

There are other phenomena that could be described to explain postmodern relativism, too many to deal with them all. Two still should have our attention, however, namely recent developments in mathematics and in science. These matters may seem a bit technical, but I cannot avoid dealing with them, firstly because they are related to subjects that are actually taught in our schools, secondly because their effects upon the postmodern world-view are very great indeed, and thirdly (and most importantly) because they provide suggestions as to how we can teach these subjects in a Christian manner. We will begin with mathematics.[51]

Ever since the Greeks, mathematics had been considered the key to the mysteries of the universe. It was seen as self-evidently true, and the method of reasoning based on it came to be regarded, both among the Greeks and in modern times, as the system that led to similarly self-evident truths in all other areas. That method, it was believed, was superior to the empirical one. Empiricism (reliance on sense data, that is, on observation and experiment) was of course used as well, in science as in other fields, but it was less reliable. Our senses are notoriously deceptive, and observation can lead only to probabilities, not to necessary truths. We may over many years have observed thousands of white pigeons and not a single black one, but we cannot deduce with certainty that therefore all pigeons are white. Tomorrow, or several centuries hence, a black pigeon may turn up.

The only way to find certain, eternally-valid truths, the Greeks taught — and modern Western philosophers and scientists agreed with them — was by the type of reasoning followed in mathematics. There one starts not from observation but from axioms or self-evident truths, and one deduces from them, by careful reasoning, further truths that are equally self-evident and sure. We are talking here about deductive reasoning, or about the axiomatic method. It is used not only in mathematics but also in so-called syllogistic reasoning. Think of the well-known syllogism: *All men are mortal; Socrates is a man; therefore Socrates is mortal.* This conclusion is not based on observation but on reasoning. It is a necessary deduction from a self-evident truth. If the premisses are true,

and if a strictly logical method of reasoning is followed, then the conclusion necessarily follows.

Axiomatic reasoning revealed such self-evident truths. So did mathematics itself. It was logical and its outcomes were universally valid. The really striking thing about it, however, was not only that it was internally consistent, but that it also fitted nature, the physical universe; that it provided the key to unlock the secrets of its structure and operations. The scientist Albert Einstein once expressed his amazement at this phenomenon by saying that the most incomprehensible thing about the universe was its comprehensibility. How was one to explain this fact? What accounted for the harmony between the human mind and physical nature, a harmony which enabled man to discover the laws of the universe?

Christians have had no difficulty explaining this phenomenon. The same God who created the universe, they say, also created the human being. He gave men and women the mandate to care for nature and to rule it as God's stewards, and to that end gave them the mind to understand the universe. This meant, among other things, that they could develop the mathematics necessary to describe physical nature. Early modern scientists, from Copernicus and Kepler onward, held this view. It explains why they saw science as a religious pursuit, and why Kepler could say that scientists were thinking God's thoughts after Him. That opinion was held by practically all the scientists in the Renaissance and the early modern era.

Human reason as autonomous

In the course of the modern period, however, faith in God declined. Scientific successes encouraged the belief that human reason with its mathematical knowledge was autonomous and capable of solving the mysteries of nature by its own powers. Not revelation, but reason decided what was true. And this applied not only in science, but also in other fields, including religion. Whatever could not pass the test imposed by man's critical reason was by definition unworthy of being considered true knowledge.

But the one thing that this secularized modernism could not explain was the relationship between the human mind and the material universe: the fact that the human mind could understand, and express in mathematical terms, the structure of nature. How was this possible, if

there was no God who had created both nature and man, giving the latter the power of understanding? Several explanations were attempted. Among them was the evolutionary one, according to which man understands nature because he evolved from it. But none of the explanations was satisfactory, the evolutionary one least of all. For how can an irrational nature produce an eminently rational structure and give rise to rational minds that understand such a structure?

Philosophically, therefore, the difficulties multiplied under modernism. But in actual practice there were no problems. Or rather, scientists were content to deal only with problems they deemed valid and solvable. As a result, science continued to make great strides, and this strengthened the belief that, thanks to mathematics, it was capable of revealing ultimate truths in all areas of life.

As more than one historian of mathematics has remarked, in the modern period mathematics and the science which it made possible took the place of divine revelation. Mathematics promised to enable mankind to answer ultimate questions and help bring about an earthly utopia. It became the idol of the western world. Finally, however, it was unmasked as an idol, and its fall produced cultural shock-waves. From the view that human reason can discover final truths and so, given time, reach up to the ultimate, people moved to the belief not only that no such truths can be discovered, but that objective, universally valid truth does not even exist.

The unmasking

The unmasking began in the nineteenth century in the realm of geometry. Until then people had followed the Hellenistic mathematician Euclid of Alexandria, who lived around 300 B.C. For more than 2000 years it had been believed that Euclid's theorems fully described the physical universe. In the course of the nineteenth century it was discovered, however, that Euclidean geometry works for plane surfaces, and therefore for the everyday physical world that science was normally concerned with, but not for areas where curvature has to be taken into account. New systems were developed which applied to positive and negative curvature, and which yielded conclusions different from the Euclidean one. In these systems the sum of the angles of a triangle, for example, was not 180 degrees, but either less or more than that, depending on the nature of the curvature. This showed that there was not necessarily a correspondence between mathematical logic and physical reality.

Worse, it suggested that more than one truth existed, and that what was true in one situation was not necessarily true in another. Different systems, all of them internally consistent, led to different outcomes. They obviously could not be universally true.

The challenges to Euclidean geometry were followed by challenges to the number system. Different systems had to be developed in algebra when it appeared that the outcomes of new experiments or observations conflicted with previous ones. Here too one system was appropriate for one class of phenomena but not for another. The efficiency of a theory became a matter not of certainty but of probability: a theory might work in a certain number of cases but not necessarily in all. Counter examples could always turn up. Experience, that is practical applicability, decided the issue.

In course of time the laws of logic, which play such an important role in mathematics, were questioned as well. Ancient paradoxes, for example, kept reappearing, suggesting that Aristotle's laws of logic, according to which a proposition must be either true or false, were not universally applicable. An example is the well-known liar's paradox,[52] but this was by no means the only one. In 1931 the mathematician Kurt Gödel directed another serious blow at the faith in mathematics and the logic on which it was based by showing that mathematics can give rise to unsolvable contradictions, and that no system of deductive reasoning can ever be fully proven or disproven.

Nineteenth-century challenges to Euclidean geometry were confirmed early in the twentieth century, when Einstein's general theory of relativity, which was based on a non-Euclidean geometry, was empirically validated. This showed that at least one of the new mathematical systems indeed fitted aspects of the physical world. Meanwhile quantum physics, as we will see presently, provided additional arguments for the view that the laws of logic were based on experience, rather than being universally true. Late-modernism and postmodernism worked this out to mean that we cannot decide in an a priori fashion between true and false, good and evil, and so on. As it is in mathematics so it is in all of life: experience alone decides.

Post-Euclidean relativism

All the different mathematical systems, also those in algebra, are usually referred to as post-Euclidean mathematics. As I said, the development produced shock-waves and inaugurated the period of what

has been called post-Euclidean relativism. People reasoned that just as in mathematics one could start from different principles to reach totally different but nevertheless valid results, so it was in other fields of human knowledge and human endeavour. Cultures, for example, could no longer be evaluated according to norms that were universally valid, and therefore no culture could be said to be intrinsically superior or inferior to another. Differences were simply a result of the fact that people started from different premisses. And what applied to cultures in general applied to religion, ethics, logic, and legal systems. As long as the systems were internally consistent and worked for those who used them, they were true.[53]

The revelation that mathematics was not the infallible way to truth did not spell the end of the discipline. It did not have to. The new systems were internally consistent, and mathematics continued to be the excellent scientific tool it had always been. The fact that the Euclidean system could not be universally applied was in itself no problem; new systems had been developed and, when necessary, new ones could presumably again be developed, systems that worked perfectly well in their own area. But the emphasis now was indeed on the fact that they *worked.* Efficiency or performativity became the buzz words.

In the early twentieth century not everybody greeted the news with dismay. In fact, many welcomed it. The denial of absolutes and the refutation of traditional truths meant a great increase in moral freedom. One no longer was tied, for example, to the Christian moral code, which now could be disqualified as 'Euclidean.' The challenge to Euclideanism also allowed for the overthrow of outdated social and political practices. Indeed, many of those who welcomed the new relativism were reformers and used the developments in mathematics to propose new ethical codes and new approaches to social and political problems.

An optimistic pragmatism, however, was not the only response. The fact that mathematics and logic were unable to lead to final truths was also experienced as traumatic. For two millennia and more it had been believed that these two disciplines opened the way to absolute knowledge, which meant that they conveyed ultimate meaning. That certainty was now irretrievably lost. The American philosopher William Barrett expressed the consequences of this loss in his work *Irrational Man,* a study on existentialism. Barrett writes of the times when people still believed, as the ancient Greeks had done, that human reason could

penetrate the mysteries of existence and reach up to God. He then continues:

> What happens, however . . . if human reason, and the knowledge it can produce, is seen to be finite like the rest of man's being? Then the possibility that the system of human knowledge may be closed and completed, that all of Being may be ultimately embraced in one vision, disappears; and man is left patiently treading the endless road of knowledge that never reaches conclusion. If science were to continue its researches uninterruptedly for a thousand years, it would not disclose to us the ultimate ground of things. Being finite, we should never arrive at the highest object of knowledge, God . . . . Theoretical knowledge may indeed be pursued as a personal passion, or its findings may have practical application; but its value above that of all other human enterprises . . . cannot be enhanced by any claim that it will reach the Absolute. Suppose, for example, that there were a road and we were told we ought to walk it; in response to our question "Why?", we might be told that we ought to do so because the walking itself would be pleasant or useful (good for our health); but if we were told that there was a priceless treasure at the end of the road, then the imperative to walk would carry overwhelming weight with us. It is this treasure at the end of the road that has disappeared from the modern horizon, for the simple reason that the end of the road has itself disappeared. [54]

I quoted at some length, because we have such a poignant statement here of the sense of futility, caused by the loss of truth and of meaning, that descended on our civilization when it replaced faith in God the Creator with the worship of a creature, and then discovered its idol's impotence. In hindsight we can say that postmodernist relativism was bound to follow modernism's idolatry of human reason, its effort to do without God, even to compete with God. As the well-known German mathematician Hermann Weyl lamented, "We have tried to storm Heaven, and we have only succeeded in piling up the tower of Babel."[55] It is striking, incidentally, how often commentators on postmodernism — Christian as well as non-christian ones — refer to Babel, that early instance of mankind's rebellion against God, and the confusion which followed it.

The new physics

The feelings of uncertainty following the challenge to the traditional view of mathematics were enhanced by developments in science. I am referring to the discoveries that led to the so-called new physics of the early twentieth century, which is sometimes referred to as the second scientific revolution. Here, too, the uncertainties were not of such a nature that they pointed to the demise of science as such. The scientific discoveries had great explanatory power and gave rise to important technological advances. They provided us with nuclear power and also with the technology necessary for the making of the computer. That is, they laid the basis for the information-based economy which characterizes our postmodern age.

Our concern is not so much with this new technology, however, as with the scientific ideas as such, and with the effect these ideas exerted upon the late-modern and postmodern world-view. Two aspects of the new physics will have our attention, namely Einstein's special theory of relativity and quantum physics.[56]

Relativity

Einstein's special theory, which was published in 1905, disproved Newton's doctrine that space and time are absolute, meaning that they are the same everywhere and for everyone. Einstein showed, instead, that they are relative to the observer. That is, distance (space) and duration (time) are different for different people, depending on their location, their frame of reference. As to space: if a person is on a train that is speeding through a station, the platform will be slightly shorter if measured by that person than if measured by someone who is standing on the platform. And as to time: the station clock on the platform will run more slowly for the man on the train than for the one on the platform. In other words, when space shrinks, time expands.

Of course, the differences in our examples will be so minute that we would be unable to notice them. But realize also that at this moment we may see events in space, such as the birth or collapse of a star, that in fact took place light years ago. And if we were to send clocks on rockets travelling at a very high speed around the earth, we would notice that they ran slightly slower than other clocks. This phenomenon has given rise to the idea of the so-called 'twins effect.' It's the sci-fi vision of an

astronaut who, after a lengthy high-speed voyage in space, comes back some years younger than his twin who remained on earth. We can speak here, with Madeleine L'Engle, of "wrinkles in time." And there are implications that are stranger still: much of the new science is the stuff of which science fiction is made.

Quantum physics

The other aspect of the revolution in science, quantum physics, had similarly strange implications. It too showed that the universe is not at all as we think it is; that it contradicts our common-sense ideas of reality. Traditionally it had been believed (and most people continue to believe it) that nature consists of two distinct elements: matter, consisting of particles and having mass or weight, and force or energy, which operates continuously and has no mass. This traditional view, the view of either-or, was turned topsy-turvy when atomic physicists found that things can be both-and: that matter can behave like waves, and non-matter like particles, depending on the instruments we use in observing them. One experiment looks for particles and finds them, another looks for waves and finds them; the observer cannot observe both at one.

We are speaking here of the so-called wave-particle duality, a phenomenon that would make possible the development of nuclear energy. This duality led to Bohr's complementarity principle, which states that quantum phenomena may be described either in terms of particle motions or in terms of waves; not in terms of both at the same time. The two approaches are mutually exclusive. We can't imagine such a world; it contradicts the one we know and experience. Classical physics – the physics of Newton and his colleagues – had made the world intelligible and picturable. It could be portrayed as a grand machine, which operated in a predictable manner. Quantum phsyics is no longer intelligible in that sense. It describes the world in mathematical terms, but it no longer tells us what it is really like. The predictability of the old physics, moreover, has at the subatomic level been replaced by probability.

The fact that our use of instruments decides whether we find waves or particles suggests that at the subatomic level the observer affects the object of his observation. This was expressed in Heisenberg's uncertainty principle. It was based on the study of the electron, which showed that you can't chart the electron's speed and its position at the same time. The act of measuring its speed influences the electron's position, and vice

versa. In the act of observation the observer, the subjective element, intrudes. The uncertainty principle suggest that we may never know what 'the world out there' is really like. In the observer's act of observation the world is changed — *and* we see what we look for, and only that.

In short, the new physics showed that the old physicists, Newton and his colleagues, had been too confident. They had believed that man could understand the universe. Remember Alexander Pope's famous couplet: "Nature and nature's laws lay hid in night. / God said, 'Let Newton be!', and all was light!" But now it became clear that man could not understand the universe, could not even picture it, at least not at the macro level (that of intergalactic space) and not at the micro- or subatomic level either. Mysteries remained and multiplied; the universe was not rational in the traditional sense, and ultimate knowledge about it was unattainable.[57]

That in itself was enough of a shock. People made it worse by applying the scientific implications of these findings to all of life and reality, just as they had done with the developments in mathematics. Einstein's relativity theory, for example, was believed to mean that all truth was relative — in other words, that there are no truths that are universally valid. Although Einstein and other scientists kept telling people that this was not the inference to be drawn from their theories,[58] it was nevertheless widely done. And quantum physics was similarly used to prove not simply that nature cannot be fully understood, but that no valid truth whatsoever can be had, either in science or in any other field of knowledge. Quantum physics with its implication that the observer intrudes, and that we see what we look for, is of course also behind the postmodernist and New Age creeds that we make our own truths and create our own reality.

A recapitulation

Before getting into the third section of this paper, where we will speak about the response of the Christian school to postmodernist challenges, it may be good to summarize what we have done so far. We began with Lyotard's statement that postmodern education at the university level is to be concerned with performativity, with what works, rather than with ideas. Science, technology, and some of the social sciences are the important subjects. The arts and the humanities will probably continue to be taught, but they have little or no economic value and won't be of

much use in preparing people for a career. At best they serve as a means to teach skills.

We noted that similar ideas inspire those who are responsible for pre-university education. Here, too, doing is the important thing, rather than knowing. Schools are to produce students who will become happy, well-adjusted, and flexible consumers and producers. To ensure social cohesion all students must be able to perform well, a goal that has led to the downgrading of the curriculum and such experiments as Spady's Outcome-Based Education.

Looking for the reasons why curriculum content is downgraded and performativity made into the only goal, we noted that one fundamental cause is the postmodernist belief that there is no truth. In the second part of the paper we tried to determine why our culture has collapsed into scepticism and relativism. We mentioned such factors as the postmodern disappointment with and reaction against modernism, the ideas of men like Marx, Nietzsche and Freud, which gave rise to what came to be called the hermeneutics of suspicion, and the conclusion of modern linguists that language is a social construct and altogether arbitrary. Also important, we noted, were developments in mathematics and science. The realization that Euclidean geometry cannot fully describe the universe, and the discovery of paradoxes and logical contradictions in mathematics were, in a reductionistic manner, interpreted to mean that no universal truth exists at all. The findings of Einstein's relativity theory and of quantum physics had similar relativistic implications.

3. Parental schools in postmodern times

In short, materialism, cynicism, and relativism characterize our postmodern world-view and, if our secular educational planners have their way, they will more and more characterize our educational systems as well. This means that in the postmodern schools students will be taught that truth does not exist, that all world-views and cultures and religions are equally valuable, and that the only important thing in life is material success and physical well-being. It also means that they will be kept ignorant of the traditions of the past, and of all ideas which may suggest to them that there is more to life than the economic dimension: that people have also a mind and a soul. Deprived of any knowledge that nourishes mind and soul, they will be easily manipulated. And so they will become the docile work force that the planners consider necessary to

guarantee success in the global market and a quiet, cohesive, governable society at home.

As I suggested in the previous lecture, if the planners succeed — and they are making considerable headway — the threat is not unimaginable that we will see B. F. Skinner's blueprint for a manipulated society put into practice. This will mean that under the planning elite's rule people will be robotized. The Canadian historian Hilda Neatby warned about this in her book *So Little for the Mind*, which first appeared in 1953. At that time already she realized that the type of education promoted by 'progressive' educational planners was conducive not to developing the students' mental faculties but to indoctrinating them, so that they could be controlled and manipulated. The outcome, she wrote, would be the enslavement of the citizens to the manipulators.

Neatby's warning is even more relevant now than it was close to fifty years ago. For although many of the roots of postmodernism are to be found in late-modernism, the situation has become public especially since the counter-culture of the late 1960s — the event that may have done more than anything to help spread postmodernist ideas. Many of today's educational leaders grew up in that culture, as did the majority of today's professors and teachers.

The importance of curriculum content

So what are our Reformed schools to do in the face of these threats? Our schools are parental schools. Parents established them to ensure that their children would be educated in conformity not with the spirit of the age, but with the spirit of the Scriptures. There are several dimensions to this requirement. One of them is that the schools must fight today's particular heresies, and that they do so, among other things, by the generous teaching of curriculum content. This means that the *transmission of knowledge* will have to be basic to our teaching.

By stressing content and the transmission of knowledge I am not suggesting that skills should not be taught, or that schools should not make it their concern to help prepare students for their role in society and in the market place. They should. Nor am I suggesting that education ought to be static, concerned only with the preservation of knowledge and not with its expansion. On the contrary: I believe, as I hope the foregoing has made clear, in preservation as the *prerequisite* for expansion. What I do mean by stressing the transmission of knowledge is that aca-

demic content, rather than performativity in Lyotard's sense, should receive the emphasis.

Elementary and secondary schools are not institutions for vocational training. They exist in order to help prepare young people for their various tasks in life; and life, as the Bible teaches us, is more than 'food and clothing.' To be prepared for life our students need, among other things, to be able to test the spirits and have answers to the challenges posed by our secular, relativistic postmodern society. And that is possible only if they have the necessary information for their minds to work on, which means that they need the proper curriculum content.

Not everybody agrees with me here, not in our own circles either. In the previous lecture I mentioned, and attempted to answer, a number of arguments against curriculum content that are heard also among us. I do not intend to repeat myself here, except to say that I concentrated on three such arguments. They were: (1) the knowledge explosion, which makes it impossible for anyone to keep up with what is happening; (2) the fact that schools sometimes fail to make academic content relevant to the students; and (3) the problem that academic content is not neutral, but often promotes secular and anti-christian points of view.

I must say a bit more about that third point. Apart from the fact that we must mediate between student and curriculum, there is also the possibility, and indeed the need, as I said in the previous lecture, to guide the students in helping them to *confront* these secular teachings. Here we come to the need for a truly Christian curriculum. And as we all know, we do not produce such a curriculum by simply prefacing our course outlines and lessons with the Christian credo and leave it at that. We must enable students to *analyse* what they study. We must help them*, in our teaching of subject material*, to develop an informed, a critical, and a Christian mind, so that they can see through the temptations posed by an anti-christian culture and answer that culture's challenges. God provides us with evidence, real evidence, of Himself and His works in both history and nature, and we must make our students aware of that evidence.

Strategies

Exactly how this is to be done is a matter of much study, much discussion, and the writing of detailed and carefully reasoned course outlines. My aim in giving this lecture is to contribute in a small way to this

mammoth effort by suggesting some of the strategies that I personally have found helpful. They are the following:

1. Make the teaching of history an integral part of the curriculum. I have written about this before and shall recapitulate only a few of the arguments I provided in favour of the teaching of history at both the primary and the secondary levels.[59] They are:

(i) Properly taught and learned, history helps students find their roots and identity, and thereby shields them from a debilitating cultural amnesia.

(ii) History is capable of honing the students' thinking skills by making them aware of the origin and consequences of the anti-christian ideologies that are abroad in society. It will show them that heresies don't die, and that modern heresies are not new but recycled ones. By studying the past, our students can recognize these recycled heresies and see through them, rather than be taken in by them.

(iii) In connection with the foregoing: History should free our students from what Cicero called the tyranny of the present. It should enable them to see not only that much of what our time proclaims as wisdom is in fact foolishness, but also that there are life-giving alternatives to present-day wisdoms in the past.

(iv) History should help students to become more clearly aware of the antithesis, the enmity that runs through human history since Genesis 3, and prepare them, also intellectually, for the spiritual battle to which they are called.

(v) The study of the past should remind our students that history develops under divine providence and enable them to find the meaning of history in the conviction of God's plan and governance.

2. Follow an integrated approach in the teaching of subject material. When I speak of an integrated approach as a second strategy, I am not thinking of the types of 'core' programmes that are recommended today. In these programmes various disciplines — for example history, geography, and perhaps even vocational subjects — are taught as one course. Although also in Christian circles it is sometimes considered a good idea to combine two or more disciplines, I personally do not find it very helpful. Subjects, in my opinion, have to be taught in sequence and as a continuum, and if a teacher is forced to move from one subject to another, that sequence is in

jeopardy and the various subjects are in danger of losing their identity. It causes confusion in the minds of our students.

When speaking of integration I am referring, instead, to an openness to developments in areas other than the subject that is being taught. Those who have read James Nickel's book on the teaching of mathematics will have noted that he, too, pleads for this type of approach. Developments in mathematics and technology, he shows, were important for the spread of the gospel, both in the apostolic age and later, and students should be made aware of this fact. It makes the past come alive for them, and it shows them that science and technology serve a function in the history of God's Kingdom; that history develops under divine providence. But remember that there is no question here of an interdisciplinary approach. The subject being taught is mathematics, not a 'core programme' mixing together mathematics, history of science, and church history. All these subjects are taught separately.

Similar opportunities for this type of integration can be found in other subjects. The one that best lends itself to the approach is history. Because it concerns itself with society as a whole, teachers of history will deal with as many aspects of the period under discussion as possible (much of course depends on the students' age level): with church and state, religion and philosophy, politics and economics, art and science, literature and music. By doing so they can draw attention to horizontal connections among these areas, show that the various cultural manifestations (being influenced by the same *Zeitgeist* or climate of opinion) tend to have a 'family likeness,' and so introduce to their students the very important concept of 'world-view' as a means to understand and evaluate both past and present societies.

3. Teach subject material in historical context. As to the third strategy: one of the reasons why I went into so much detail about developments in mathematics and science was to show the importance of a historical approach in the teaching of these subjects. In the teaching of mathematics this approach allows us to show to our students that postmodern relativism is very strongly influenced by the modern idolization of mathematics and of human reason in general. It also enables us to introduce the Christian answer to the question why mathematics 'works': namely the fact that God created both man and nature and provided man with the ability to understand the mathematical structure of the universe.

It therefore allows us to teach this subject, which educators have often regarded as 'neutral,' in a Christian manner. James Nickel's book is helpful here, as are the other titles I mentioned in the footnote on sources dealing with the history of mathematics. I also refer you to the extensive bibliography that Nickel provides.

The historical approach to the teaching of science has similar advantages.[60] It, too, shows how the attitude of western thinkers shifted from faith in God the Creator to idolatry of an autonomous human reason capable of finding absolute truths, and thence to the denial of man's ability to find any truth at all. Giving attention to the history and philosophy of science also allows us to relativize the faith in the cult of scientific objectivism. We can show students the influences that have gone into the construction of scientific theories (such as the evolutionistic model, for example), and make them aware that such theories may indeed be backed up by an impressive amount of scientific evidence, and that they may have great explanatory power, but that they are neither fully objective nor infallible — and not eternal either. They come and go.

But at the same time we can counter the postmodernists' relativistic conclusion that mathematics and science are simply language games, incapable of leading to any truths about the world. The history of mathematics and science makes it abundantly clear that God gave man the ability to understand nature. To be sure, our knowledge will not be exhaustive, but it can certainly be reliable. As one author put it (I can't find the reference just now): the scientist is like a blind man with a cane. The cane does not enable that person to explore whatever he may want to explore, but it does allow him to find what he needs to find. And is not, as Art. 2 of the Belgic Confession tells us, the same thing true with respect to the limitations *and* sufficiency of our religious knowledge?

And what goes for mathematics and science goes for other subjects such as art, music, and English literature. They too should, if at all possible, be taught in historical context and sequence. For vertical connections are no less important than horizontal ones. After all, we are part of a community that spans the ages.

4. What knowledge is of most worth?

We have come to the final section, which deals with the question as to what knowledge is of most worth in a Christian school. We are fac-

ing a complex issue here, which, if I wanted to do full justice to it, would take a lot more time than is available at the tail end of a lecture. It is also a tricky question because, once you create what looks like a hierarchy of knowledge, you may leave the impression that whatever is placed at the bottom is dispensable, or at least of limited value. In the context of Reformed education that is not the case, however. On the contrary, what is placed at the bottom is foundational. I will begin with that lower level. That means that I will begin with the normal school curriculum.

A lot depends here on a student's ability and aptitude, but I am strongly convinced that all students should have as rigorous as possible an education in the traditional curriculum — even if that means stretching them. A bit of stretching, as physical education teachers well know, is all for the good. It is rather typical of our topsy-turvy world, incidentally, that at a time when body-building is in — which includes the stretching of one's physical endurance to the utmost — progressive educators are so afraid of stretching the mind. I wonder if — in addition to all the factors we already dealt with — the faith in evolutionism has something to with this, together with Sigmund Freud's ideas. Darwin and Freud taught, as you know, that man's mind is of recent origin, much more recent than his animal nature. Could this doctrine possibly suggest to our educational thinkers that the mind must be considered to be much weaker, much more fragile than the body, and therefore unable to take all that much stretching? One wonders.

However this may be, we who believe in man's distinctiveness from the animal know that to deprive anyone of rigorous mental training is to waste his mind, and as Hilda Neatby and various others have said, a mind is a terrible thing to waste. To deprive our students of the knowledge of their civilization is to prevent them from knowing their cultural roots, from understanding *and* enjoying their cultural heritage which, while certainly not perfect, has nevertheless been in so many ways, under God's blessing, a good one. Let's say this openly and repeatedly in these times of western-culture-bashing. To deprive students of cultural knowledge, of the knowledge of their society's past, and in that manner also of a rigorous mental training, is also very likely to interfere with their ability to do well in the career or profession of their choice. And, to skip other possible arguments, it will seriously interfere with their ability to execute their mandate as citizens and as Christians.

This will have to do for the bottom level, the foundational one, in the hierarchy of worthwhile knowledge. The top level is connected with it; it cannot really exist without it; and in the discussion of the bottom level I have already touched upon much of the top one. That top level is that we teach in such a way (in selecting the material, in providing context and framework, in choosing opportunities for guided confrontation, in following the proper approach and in using the appropriate methodology) that our students become wise, as the Bible defines wisdom.

We must keep that ultimate goal in mind, not only when we teach Bible history and Christian doctrine, but also when we teach academic content and cognitive skills. For neither content nor skills are ends in themselves. They are subservient to a larger goal: that of enabling our students to fulfil their tasks in life; to understand, analyse and criticize the spirit of the age that assaults them; to find meaning and delight in the study and ever-increasing understanding of the inexhaustible treasures of God's works in nature and history; and so to prepare them for their life and work as citizens of the Kingdom. For they are royal children, and they must be educated as such.

To reach these goals is the supreme challenge that faces every Christian teacher. None of us will meet it to the extent he or she would wish, but the ideal remains, and we will continue to work toward it. For the ideal sustains us; it is, in the end, the one thing that makes up for all the failures and disappointments and frustrations that inevitably go with the job; the thing that makes our work worthwhile because it gives it lasting value.