

SCIENCE FACULTIES MEETING
January 22, 1971

8:30	Dr. Hoeh	INTRODUCTION
8:40	Mr. Herrmann	Speculation versus Vision
8:50	Mr. Hegvold	Attitude, Purpose, Goals in Science
9:00	Dr. Winnail	Biological Science Laboratory Method Dissection
		Discussion
9:30	Dr. Erlander	Nutrition and Laboratory Methods Used in Teaching
		Discussion
10:00	Dr. Hoeh	Carbon 14 and Archeology
10:15	Mr. Herrmann	Evaluation of Geologic Ages
		Panel Discussion by Dr. Hoeh, Mr. Macdonald, Mr. Burky
11:00	Mr. Hegvold	Problems in Measuring the Age and Extent of the Universe
		Discussion
11:30	Mr. Herrmann	Effects of Artificial Selection versus Natural
		Discussion
11:55	Dr. Hoeh	Closing Remarks

PARTICIPANTS:

Mr. Burky	Dr. Kuhn
Dr. Carruthers	Mr. Lee
Mr. Deakins	Mr. Macdonald
Dr. Erlander	Mr. Oberlander
Mr. Ginskey	Mr. Schurter
Mr. Hegvold	Dr. Stenger
Mr. Herrmann	Dr. Winnail
Dr. Hoeh	

SCIENCE FACULTY MEETING - JAN. 22, 1971 - 8:30 A.M.
INTRODUCTION: DR. HOEH

DR. HOEH: I should like to extend my thanks this morning to Dr. Germano, who over a year ago prompted the idea that especially in the area of the sciences, we should have an occasion in which to discuss not only matters pertaining to particular departments on the campus, but to lay a foundation in which individuals with special areas may make contributions to members of the faculty as a whole, and also may make general contributions to the College and Church. And in some cases, of course, some of these might--might even be papers that would be available for general publication unlike the tradition in an area like this which is essentially secular and has been so for approximately 170 years. I think it appropriate that we rise and ask God's blessing here if we would.

(Prayer)

The growth of the sciences on the Pasadena campus has been extremely slow for financial reasons. Mr. Herrmann has been very conservative here in the development of it, but the soundness with which we have developed, I think, is a reflection of his overall supervision over the many years in which he shared, in fact most of the areas at the earliest time, deeply with me in transition. Since then we have been able to add the men that you see here, and happy to even have some of the men who were associated with the College here transferred to Texas.

The purpose that I would like us to focus on today

is that we should seek to understand the foundations on which science as it is practiced here at Ambassador College should be conducted. First of all, we are necessarily involved with an interrelationship between science and theology. Next, we are involved, as the series of lectures will indicate, in the attitude both of us who are here, as well as the education of others who are not here, who may or may not properly understand the purposes and goals of science.

One of the fundamentals that I always have to stress is that most scientists are illiterate. As one man addressing a science convention nearly a decade ago said, "Illiterate in the sense of our inability to convey the thoughts of science to the layman to make them intelligible both in terms of attitudes, purposes, and goals."

Internally on the campus we are necessarily involved with methodology which will be discussed in two lectures widely divergent and yet not unrelated areas. In terms of theology we are involved with the question of the interrelationship of Radio carbon dating which began essentially in 1949 and its impact on archaeology and the interrelationship of archaeology and geology and the interrelationship of both disciplines in the historical experience of human beings in the Biblical records.

Normally hereafter all of the programming will be based on the fact that well into summer we should have made arrangements such that any discussion or papers which you would give would be made available to the science areas here on the Pasadena Campus in such a way that we can organize the program and know the subject matter. And in fact be able better to evaluate what might yet

be worth discussing or what might be better deleted because it is far beyond the need of the limited time which we have.

We had to hold ourselves this morning to a single morning period rather than morning and afternoon because of other duties. None of the papers presented here will be actually read. They will be orally commented on, which I would normally prefer. I think hereafter if we make such arrangements six months in advance we will be able to feel free to invite many others on the campus here to attend. But for the first time we should hold this as a kind of in-house occasion.

SCIENCE FACULTY MEETING
MR. HERRMANN

Speculation versus Vision

My wife asked me this morning, "Are you sure the science faculty can get together without ending up in a free-for-all?" This is a sad commentary on science and yet it is the common view held by the nonscientist. The recent issue of Life magazine has an article exploring the pros and cons on DDT. Can scientists really get together and arrive at the truth? Note that Rachel Carson's book Silent Spring was published in 1962; yet even today scientists are not in agreement as to whether the use of this pesticide constitutes a danger to mankind. Quoting from Life magazine:

"And DDT also raises the agonizing question we face in our environmental decisions -- the problem of determining "the truth." Trying to learn about the chemical, one slogs into a swamp of claims and counterclaims, information and misinformation, where facts are a dime a dozen, and the price of a paperback will buy all you need to prove any point you want to make. There have been some 50,000 publications on DDT. A recent government investigating commission had to review some 5,00 separate documents, and state hearings in Wisconsin resulted in 4,500 pages of testimony, most of it contradictory. One expects the scientists to provide the truth, scientists being dispassionate men who can eliminate prejudice and emotion and tell us what is really going on here. But one learns that at the sticking point, science breaks down, and the scientists are sometimes wrong, frequently biased, and usually incapable of agreeing among themselves." (January 22, 1971, page 48B.)

Another quotation from the Pasadena Star News on Wednesday, December 28, 1966 is entitled "Science: Drowning in

Sea of Facts?":

"Since the world's first scientific journal began in England 301 years ago, (Dr. Brown, professor of geochemistry at Caltech, speaking for the Advancement of Science in Washington pointed out) the number of scientists, technical journals and scientific papers have all doubled about every 15 years. . . . Today 35,000 scientific and technical journals annually publish two million articles in some 50 languages. . . . In the face of such chaotic conditions, an individual scientist cannot hope to absorb more than a trace of the flood of data.'"

Returning again to the quote from Life magazine:

"Both the pro- and anti-DDT factions have corps of scientists who function as the heavy artillery in each engagement. Ponderous with academic honors, the scientists rattle their advanced degrees and fire mighty rhetorical broadsides at each other. They are expert in the techniques of persuasion and are just as capable as the rest of us of loading arguments, waving red herrings and ignoring conflicting data."

Now is this what science really is? There are millions and millions of facts and do we just pick out anything we want to prove and prove anything that we want to prove? I am emphasizing the process of speculating, getting only a part of the facts, building with that partial data a house of cards, and then presenting it as the truth. Yet the layman supposes that anything and everything the scientist says is true. It should be so, but reality is another thing.

Another problem we face as scientists, or pretending to be scientists, is that people look at us and think of explosions, of going to the moon, of poisoning the whole world, and of having all the answers. They also look at us as being "far out."

The kind of clippings that are sent to my office demonstrate this continually. As a typical example here is one entitled "Life May Have Evolved From Poisonous Gas." Built on that "house of cards"

are three implications: a new theory on the origin of proteins; the hope that synthetic foods may eventually be produced by manufactured proteins; and more evidence that life exists on other planets. This item comes from The Asian Student, December 10, 1966.

Another clipping sent to my office is entitled "What's Dat? Briton Says He Crossed Dog and Cat," Los Angeles Times, Friday, December 11, 1970. This particular article is certainly of value in determining the limits of the Genesis kinds and we would expect to see results similar to the crossing of the horse and donkey to produce the sterile mule. Yet it illustrates the "far out" view that others have of scientists.

Our science classes ought to be interesting and provide useful material. Typically, education is dull and boring. Dr. Ernest van den Haag, lecturer in sociology and psychology at the New School for Social Research in New York City, makes the following statements:

"I think sex education is one of the most stupid rackets I can imagine. . . . It probably doesn't do any damage, but it's a waste of time. The only advantage I can see in it is this: Our schools have shown a marvelous ability in the past of making any job, any subject dull and boring. Perhaps they will succeed with sex, too--and if they succeed in making sex dull and boring, perhaps we will be able to solve the population problem." (U.S. News & World Report, January 25, 1961, page 71).

On the one hand we have college courses that are dull and boring, on the other hand the temptation to present "some new thing." Suppose you had a copy of every newspaper in the world and they were all one week old. What would they be worth

above trash value? And novelty value, of course? Newspapers continually present "some new thing," and when some new thing is a week old, it is almost totally worthless.

I have another item photostated from Life magazine some years ago entitled "Technological Know-How Plus Know-What."

"In an age when technology is rushing ahead with increasing momentum, one would expect every educated person to be well up on his science and that the old rift on college campuses between liberal arts and the sciences would have narrowed. But it hasn't been closing nearly as fast as it should and every year thousands of would-be humanists are turned loose who are not only ignorant of science but are anti-technology and anti-science . . . And two weeks ago Howard W. Johnson, president of M.I.T., gave a timely reminder of the importance of bridging the gulf -- and the crucial distinction between a liberal education, which includes science along with the humanities, and a "liberal arts" education. . . . We need people who, in Norbert Wiener's words, have the one quality more important than 'know-how.' This is 'know-what'--by which we determine not only how to accomplish our purposes, but what our purposes are to be."

Are we here at Ambassador providing our students with a "liberal education?" A word of caution is needed with regard to over-specialization. True, we need our specialists, yet the typical Ambassador student should be learning "more and more about more and more" rather than "more and more about less and less." Among any group of our graduates, there should be an answer to any question our radio and television audience might present in the field of science.

Our students should be learning valuable basic knowledge, not just fascinating bits of far-out twigs. To learn some new thing? Of what value is it?

We were chosen as Pioneers, the opportunity is ours, what kind of foundation are we going to build for the generations to come?

We need people who have a quality much more important than know-how, and that is know-what. Mankind needs to know first, not just how to accomplish his purposes, but what his purposes ought to be. The scientists can tell man how to do it, how to put man on the moon, how to look at Mars with his satellite cameras, but mankind desperately needs men in key positions who can tell him whether he should carry out these ventures. The scientific community can tell you how, but surely the scientific community needs an overseer, providing theological guidance so that "know-how" is properly directed.

I would like to end with this statement: Science, when the name is properly applied to the proper thing, is what is known, not what is unknown. The clippings that come to my office of the unknown, the weird, the mysterious--these are not science. They should not represent the primary interest of our science students.

I would like to see us have a Science Department that emphasizes and uses basic material, known material. This function of giving this type of guidance to College and Church has been pre-empted in the past by Editorial in preparing various materials for The PLAIN TRUTH, and The WORLD TOMORROW. It is a function that properly belongs in the Science Department.

Know-what and know-whether should hold first position over the traditional science-oriented goal of know-how. Certainly this world is filled with a thousand times more science that it has properly used, or can properly use.

Mr. Hegvold Attitude, Purpose, and Goals in Science

A few of the points that Mr. Herrmann mentioned will be similar to some that I will give to illustrate the subject of goals in science.

Dr. Victor F. Weisskopf gave a talk entitled "What are Elementary Particles?" at the recent AAAS meeting in Chicago, December 1970. Dr. Weisskopf is an eminent theoretical physicist and a well-known authority on subnuclear physics. His talk, and the talk given by Dr. Lederman, illustrate very vividly the subject of goals--or lack of goals--in science.

"What are elementary particles?" he began, "Nobody knows --it depends on the specific conditions." He said that there is now evidence to indicate that the subnuclear particles--the proton and the neutron--are not, in themselves, elementary particles. These theoretical elementary particles of which the proton and neutron are said to be composed have been given the unlikely name, "quarks."

Some of the comments that he made about "quarks" were very enlightening. First of all, he said that he didn't believe they actually existed. The reasons that he gave for not believing in their actual physical existence was the most interesting aspect of his talk, and have a direct bearing on understanding the goals, or lack of goals, in science.

Theoretically, each proton or neutron would have to be composed of three "quarks" which would require that each "quark" have a $1/3$ unit charge. A whole unit charge for the electron and the proton has long been cherished as the fundamental indivisible

unit of charge by all physicists.

A second point that puzzled him about the "quark" was that it did not exhibit relativistic magnetic properties in spite of the tremendously high energies involved. Such high energies would involve velocities close to the speed of light. Each time I find a loose brick in the theory of relativity I happily make special note of it.

Dr. Weisskopf said that, even though he did not believe in their physical existence, he used them because they worked out mathematically! He told a short anecdote to illustrate this point. One of his colleagues was visiting another scientist friend at his lakeside cottage. As he walked through the door he noticed that there was a horseshoe nailed over the doorway. He said to his scientist friend, "Joe, I didn't know you believed in that superstitious stuff! Do you actually believe that a horseshoe will bring you good luck?" Joe replied, "No, professor, I don't actually believe the horseshoe will bring me good luck, but the fellow who sold me the horseshoe told me that it would work whether I believed it or not!" So even though he did not believe in the actual physical existence of "quarks," Dr. Weisskopf said he used them because they work out mathematically.

That afternoon, Dr. Leon M. Lederman of Columbia University gave a very interesting talk bearing on the direction and goals in science. The title of his talk was "Speculations and Fantasies." He made a lightly humorous spoof of the progress of science through the ages. Even though he was making a spoof of science, he was very articulate and one was left with the serious impression that he was genuinely concerned about the direction that science has taken.

He started with the ancient concept that matter was made up of the four basic elements: fire, earth, air and water. Since this was a seminar on particle physics, he proceeded from that point in its history to show the progress in particle accelerators. He even worked out the energy, in electron-volts, for the Tower of Pisa as one of the first accelerators. He traced the progress of accelerators from that point to the modern high-energy Betatrons. Note that all of these high-energy accelerators serve only one purpose--to investigate subnuclear particles! At this point he posed the question: "What are we going to find as the ultimate elementary particle? What if--and I don't believe the 'quark' exists either--but what if we find out that the 'quark,' itself, is not the ultimate elementary particle? Wouldn't it be interesting if, on breaking down the 'quark,' we should find that it were composed of: earth, air, fire and water?"

He used three slides in the conclusion of his talk. The first was an aerial view of the world's highest energy accelerator now under construction at Batavia, Illinois--it just showed up as a huge, four-mile circumference circle on the ground. The next was an aerial view of the world's next largest accelerator in Europe--again it showed up as a huge circle on the ground. The third, and last, was an aerial view of Stonehenge--again it showed up as a huge circle on the ground, but this time, in ruins. He concluded with this statement: "The similarity is remarkable!"

These two talks are indicative of the strange direction --or lack of direction--science has taken. Where are they going? What are the goals in science? Does anybody know?

The topic under discussion here is the attitude in and towards science. I'm sure that you are aware of the fact that a large segment of the faculty and many members of God's Church are antagonistic towards science. Why? Simply because our goals are not properly set! We're doing something wrong. If we were to approach it in the right way, they would naturally follow our lead. The goal is very ably set out in the college bulletin. The general goal given in the Ambassador College Bulletin should be the goal in science as well: Recapture True Values! But that is a big statement! What are the true values? What true values in science have been lost?

The first and foremost truth that has been lost is that God is The Law-giver! Every theory of evolution starts with laws already in motion! No attempt is made, or even felt necessary to explain their existence! Why does that not seem necessary? They seem to think it's necessary to try to explain where the big super-atom came from for their "Big Bang" theory. Of course, all they do is to push back a little further into history to a proto-atom, but, at least, they see a need to try to explain its existence. Why doesn't it seem necessary for them to explain the existence of laws? They never do! I think that there is a very basic reason for that. All basic science courses should emphasize that aspect first--the existence of laws and the fact that those laws are absolute! The existence of absolute laws absolutely demands a Law-giver! No evolutionary process ever postulated, to my knowledge, can explain this! So they don't try!

Anthony Standen has this to say about Science and God in his book entitled, Science is a Sacred Cow, on page 200: "The

first purpose of science is to learn about God, and to admire Him, through His handiwork. If any usefulness comes in--as it does in large quantities--why, so much the better."

The technological aspects of science have been receiving the emphasis in our modern colleges and universities--basic concepts and laws are glossed over, if taught at all. The result is that, even in this highly technical society, the average well-educated person is scientifically illiterate!

The goals and purposes of science at Ambassador College, as well as the limitations to scientific investigation, should not be left to the science faculty alone. There is an important and direct interrelationship between theology and science. Theological aspects must be considered when considering the goals for science at Ambassador College, otherwise science at Ambassador College would also go the "quark" way! Why should we want to go down that road? I don't say that they are necessarily in error--that there is anything factually wrong with what they are finding--but what value is it? We need to be looking for true, meaningful values! We need to learn first the handiworks of God!

The foremost area for that is in a basic science program that should give the student the opportunity to see physical laws in action. Simple things, such as an Atwood's machine, for example, to investigate the acceleration of gravity. Simple things like that can be used to show the student how these very basic laws function. One of the most interesting assemblies that I have had the opportunity to give, was one in which I gave just such simple demonstrations. For example, I used a weighted bicycle wheel to demonstrate, in a very effective way, the effects

of angular momentum. We debunk the modern theories for the formation of the solar system--the Nebular Theory, for one. We tell the student that it could not form the way they theorize that it formed because it would violate a very stable and inviolable law of physics--that of the conservation of angular momentum. How many Ambassador Students do you feel know what the conservation of angular momentum is? Very few, if any, I'd say! Yet we expect them to follow our arguments when they don't understand the basic law! And they don't understand because we have never taught them these fundamental basic concepts of physical law!

Laboratory and demonstration periods are essential for a student to get an understanding of how basic laws are working in his environment. The design of the lab course as well as the equipment should be for basic teaching aids rather than for research work. I have been teaching a basic course in chemistry for the past year, it includes one lab period per week. There is quite a bit of student interest in the course. I even have a few girls in the class. It's a "cook book" course, but then these girls will be doing a lot of "cook book" chemistry in their own kitchens some day. I even stress that point to them--that the reactions that take place in their own kitchens are more complex than those that we investigate.

So this--a basic, down-to-earth, realistic, simple approach to science--is what needs to be stressed in the science curriculum at Ambassador College. I think, with that in mind, we can reach the proper goals in science. We can recapture the true values in science. Once that goal is set and understood, the alienation of the so-called non-science faculty will just disappear.

SCIENCE FACULTIES MEETING
MR. DEAKINS

Dr. Hoeh

There are two categories of law--one spiritual and the other physical. In our society, the theologian deals with the former and the scientist deals with the latter. This, however, doesn't mean that one can't know the other--in fact, each must know about both spiritual and physical laws to explain their own disciplines. Nor can either ignore the other. To do so leads to wrong reasoning and confusion. The theologians of the world have rejected, to a large extent, science (witness many of the pagan doctrines of the past) and many scientists have rejected religion; as such they have rejected the Bible and revelation. This, in turn, has led to vain reasoning and error. Both religion and science ought to be and can be in harmony. Our job is to reach this point of harmony. Once this point is reached, science has "fantastic applicability" to our understanding the Bible, and the Bible will increase our understanding of the world around us and answer many of the WHY questions.

In order to answer the question "How far should we go in using science?" we must know the limitations and imperfections in science. We have not been told all there is to know, for if we had, the world couldn't contain the books necessary to catalogue and explain all knowledge--besides, I'm afraid we would have eliminated ourselves long ago. And there are some things that are secret and belong only to God (Deut. 29:29)-- these we

won't know until we have a spirit mind to comprehend them. So, in a great many areas we are left to "find out" or gain knowledge. This is not wrong or evil if used properly and with Biblical and Godly wisdom. The world misuses knowledge which will ultimately bring its downfall. The world doesn't have the wisdom to use knowledge rightly. Scientists don't know how to use wisdom in answering important questions (or not so important, depending on your interest) since they reject revelation and, as such, Godly wisdom. IF we have and use GODLY WISDOM, I don't think there is a limit on our use of science--it can become a very effective tool--but only a tool. But the question remains: "Do we have the wisdom to know how to use knowledge and, as such, science rightly?" With some, in the past, I would have to say No!

What are some of the limitations of science in the world today?

(1) They tend to reject revelation in their own field. Observation, experimentation, and even reason aren't wrong in themselves (if guided properly), but without revelation they are of no value because they can lead one in the wrong direction without his knowing he's being led astray. Witness evolution.

(2) Scientists themselves do not, and apparently cannot, agree about certain of the deepest and most central aspects of science. Even the "greatest" ones in the most advanced field of physics, such as Einstein and Bohr and Planck and Dirac -- cannot agree (even with the seeming straightforwardness of physics, chemistry, astronomy, etc.) as to whether and how science explains anything. SCIENCE IS A VERY HUMAN ENTERPRISE. This is due partly

to #1 above and also to human nature itself.

(3) A third limitation, and a rather shocking one, is that science does not furnish any really ultimate or satisfying explanations to phenomena. When we restrict attention to moderate-scale phenomena, involving, say, objects above electron-microscopic size, and if we stay away from such phenomena as the toss of a single coin or the decisions of a single mind, then science can offer "explanation by analogy," this being useful, interesting, and curiously comforting. But this kind of explanation is, fundamentally, a complete illusion: and at the other extreme, the strict and formal abstract type of a scientific theory contains nothing whatsoever that constitutes, in any ordinary sense, explanation.

Due again to rejection of revelation and understanding.

(4) Science is essentially statistical in nature. Statistics can be (and all too often are, especially in biology) used to back up a predetermined conclusion rather than letting the statistical data determine the conclusion. We too are guilty of this in many ways because all too often we use stats that back up the point we want to make. This can be fine in non-scientific publications but has no place in science.

Since science is statistical in nature, this means that perfect accuracy is unattainable in any measurement and that certainty is impossible in any prediction. Mistakes can be, and often are, made in technique, data gathering, etc. A man can work a lifetime on a project or "proof" and not realize there may be a built-in error in his system. Again, witness evolution. This brings us to another limitation-- that of the use of LOGIC.

(5) Logic is an intergral and central part of science. Two main types of logic are used: (a) deduction and (b) induction. In the former, one begins by making a certain number of pure assumptions--technically speaking, he adopts the postulates of the system under examination. Then with the addition of a certain accepted vocabulary of signs, and certain assumed formation rules for deriving new formulas from old ones--with this assumed machinery one then proceeds to answer the question which led to the above assumptions. Or, if you please, find the truth of the matter.

The only problem is that one only unrolls the formerly correct (or incorrect, as the case may be) relationships--which were inherent in what he originally assumed. This procedure is, of course, quite powerless to create truths. It can only reveal what has been previously and unconsciously assumed. The question, "Is there an inner flaw in this system of logic I've used?", is a question which is simply unanswerable. Such a system is essentially incomplete. Within the system it is always possible to ask questions which are undecidable.

Dr. N. Goodman has stated, ". . . the ability of induction to deal with a future case collapses; and since this is the only useful aspect of inductions, we are faced by total collapse.

"Thus I must report to you that discouraging news has leaked out of the citadel of logic. The external walls appear as formidable as ever; but at the very center of the supposedly solid fortress of logical thinking, all is confusion. As practical tools, no one doubts the continuing value of armaments. But in

terms of ultimate and inner strength, the revelations are astounding indeed. The ultimate basis of both types of logical thinking is infected, at the very core, with imperfections."

One can only recall Dr. Charles F. Kettering's warning, "Beware of logic. It is an organized way of going wrong with confidence."

One can spend years or even a lifetime proving an assumption that never answers the original questions--and often the original question becomes lost in the confusion.

(6) This particular element of imperfection has to do with the supposed objectivity of science. It is widely recognized that any natural event has a number of possible explanations. It has been demonstrated that if a certain body of experience can be usefully interpreted through one particular theory, then there is always, in fact, an infinite number of other theories, each of which will equally well accommodate the reasons for preferring certain of these theories. Often, there is a tendency to accept the alternate explanations, the one which seems in some general sense to be "the most credible," and the "ultimate in criteria of credibility," says Dr. Charles E. Goshen (Saturday Review, Feb. 1960), "is scientific objectivity."

To many, the theory of evolution sounds more credible than the religious dogmas of the religions of this Satanic world.

Non-scientists and many scientists don't realize these limitations or imperfections exist and, as such, become vain in their reasonings. But the answer as to whether or not we can use it (science) rightly, I think depends on how converted we are

and how much Godly wisdom we have.

Topics such as measuring the universe would be interesting, but I don't see how we can become involved with something as complicated as this without proper training, equipment, etc. Genetic variation is something that is "more down to earth" and we can learn more about it. Not so much speculation. Any topic with a great deal of speculation such as cosmology, historical geology, etc., is tricky because of some of the above limitations and the fact that we just don't have enough data. Interesting to discuss, but I feel it will take Christ to give us the absolutes. We need first to learn the basics and become better equipped to handle the detailed and speculative type subjects than we presently are.

ADDITION TO MR. HEGVOLD'S PAPER ON
ATTITUDE, PURPOSE AND GOALS IN SCIENCE

DR. WINNAIL

With regard to the purpose for studying and teaching science at Ambassador College as mentioned by Mr. Hegvold (to show the need for a Law-Giver), I would like to suggest several other facets. Additional aspects of our purpose would include (beginning with Mr. Hegvold's):

1. POINT OUT LAWS--show the need for a Law-Giver. Also that laws (as stated by man) are at times only partly true in themselves.
2. EMPHASIZE DESIGN--show the evidence for a Designer and the impossibility of any other explanation. Proper appreciation of the significance of design requires a certain amount of in-depth study.
3. STUDY APPLICATION OF LAWS
 - a. Historical use and misuse of laws as the background for current problems.
 - b. How laws could be applied properly--emphasizing the creative application of laws in real-life situations.
4. STUDY THE INTERRELATIONSHIP OF LAWS among the various fields of science (physics, chemistry, biology, etc.) and as they illustrate spiritual principles.
5. SEARCH FOR NEW LAWS AND NEW RELATIONSHIPS

Many of the laws and relationships Mr. Hegvold would point out (No. 1 above) were discovered by men--

often accidentally--and without the aid of knowledge revealed by God. Using revealed knowledge as a starting point and as a guide-line for further research should prove much more productive. The full potential of this new approach has yet to be realized.

6. LEARN THE FUNDAMENTALS AS WELL AS THE LIMITATIONS OF OF A DISCIPLINE

A study of chemistry, biology, etc. should acquaint students with what chemistry, biology, etc. can do and what they cannot do.

7. TEACH STUDENTS HOW TO USE THE SCIENTIFIC METHOD PROPERLY

--how to prove a conclusion is true or false, how to think logically and to correctly use facts of science in the process of decision-making.

In summary, I think our attitude toward science should reflect the balance we espouse, not all positive or all negative, but a proper blend of the two. To assume science is bad and its discoveries are to be feared seems like a throw-back to the Middle Ages. To assume science can do no wrong and needs no other guidelines than human curiosity is to endorse the methods that underlie the current dilemma facing mankind today.

Our goal in teaching and studying science should be to foster in every student an understanding of science as well as an understanding of theology. Students should learn to appreciate the capacity of science to arrive at physical truth as well as its limitations. The need for revealed spiritual truth as a foundation for the proper use of science should be emphasized.

Most scientists today have a lot of technical knowledge about science but have no concrete guidelines for using that knowledge. Ambassador students and many graduates have the guidelines that would direct the use of science but they have little idea of what science can do! One of our responsibilities as members of the science faculty should be to rectify this situation.

SCIENCE FACULTIES MEETING
January 22, 1971

Discussion period (following Presentation at 9:30 a.m.)

J. D. Carruthers: Continuing the theme begun by Dr. Erlander and referred to by Dr. Kuhn, I feel that it is extremely important that students should receive some experience in a science laboratory. In a chemistry lab, for example, a student finds himself (or herself) forced to use his powers of observation, experimentation and logic to solve very tangible problems. Such situations are continually created in the laboratory, both in the teaching laboratory and also in the research laboratory.

The need for persons in the Work, who are able to approach problems using precise, logical, rational arguments and reach definite solutions, is certainly great at the present time. By operations which involve, in many cases, experimentation and elimination, a student learns how to tackle problems in the simplest, most efficient and most effective way.

Almost every department in the Work is at present utilizing a great deal of advanced technology. Each student should therefore become familiar with the methods of science which allow a correct solution to a problem in these areas of technology to be reached.

DR. KUHN: I might mention that it was Mr. Herbert Armstrong who changed the original title of "Science and Theology" to "Science versus Theology?" It adds to the punch, and keynotes our educational objectives which are dual: (1) To show that the religion of this world contradicts the science of this world; (2) To show that God's true religion is in complete accord with true science. Unfortunately, we've had a rather poor response--with a few notable exceptions--in this area from our science faculty. Often we do not have articles to choose from--unless just two or three will be doing the writing all the time (which I think would be unwise). As Dr. Hoeh was saying, our primary purpose in our Science vs. Theology section is to give a step-by-step education to our readers. In addition, I think we have a secondary purpose of showing sophistication and expertise in areas and disciplines which may not be interesting to all of our readers. We've seen excellent responses from intelligent people on some articles which no doubt do not get widely read. But all of our readers are very happy to see that we're at least able to handle the most technical subjects. That doesn't mean that these articles should not be understood: we are striving to achieve a balanced approach. A related point that I'd like to stress is that of rigorous logic. Ninety-nine percent of the time --in articles and classes--our conclusions are correct. But we often put this conclusion into disrepute by faulty logic. Just because a man is converted, knows his Bible, and concludes his article with a Biblically sound conclusion, doesn't miraculously validate his method for obtaining that conclusion. Often, the title, purpose, questions, points, discussion and conclusions will be completely dissociated from one another. And as a result, educated

persons reading the article will be forced to derogate the specific (correct) conclusion and also God's Work as a whole. A proper appreciation of the scientific method, proper reasoning procedures, logically sound thinking and careful circumspect analysis are things that must be taught and emphasized in the classroom, and inculcated into our articles.

BIOLOGICAL SCIENCE LABORATORY METHOD AND DISSECTION
DR. D. S. WINNAIL

Biology is the study of the living world--the study of what stands revealed in God's creation. In order to gain knowledge in the field of biology, man has developed numerous tools and techniques of investigation. I would like to briefly discuss two of these methods of investigation, (a) experimental research and (b) dissection, as they might relate to our academic program. Special attention will be given to the following questions:

- (a) Of what value would an experimental research program be to Ambassador College?
- (b) Is experimental research permissible by way of Biblical example?
- (c) Is dissection of plants and animals permissible and if so what kind of animals may be used?

EXPERIMENTAL RESEARCH AT AMBASSADOR COLLEGE

A state of crisis exists today in the scientific world. The knowledge and power man has acquired through scientific research has failed to solve his problems. In fact, they now threaten his very existence. The problem stems from man's approach to knowledge as well as his use (misuse) of knowledge. In the first place, man's fund of knowledge has no real foundation. Man has no solid foundation or framework upon which to build as he acquires new knowledge. In the second place, man's acquisition of knowledge has no overall purpose other than acquiring knowledge for knowledge's sake. While this is not necessarily wrong, it has led to a lot of useless research today where the emphasis is on learning some "new fact" instead of establishing sound and

practical principles (i.e., what other drug causes cancer, instead of why cancer is caused in the first place). Finally, man recognizes no absolute guidelines governing the acquisition and use of knowledge. As a result, man has misused knowledge and gone into areas that God never intended (artificial insemination, genetic research, artificial organs).

Ambassador College occupies a UNIQUE POSITION at this critical point in man's history. With respect to science and research, we have several alternatives from which to choose. We could follow the worldly trend of blaming science for our problems--an approach which seems to illustrate the "pendulum" nature of man's carnal mind. We could tolerate (or fear) science as a necessary evil at our college for the purpose of accreditation. Or, more fitting to our motto of "Recapture True Values," we could harness the power of the scientific method and channel it in the right direction.

Ambassador College is ESPECIALLY EQUIPPED for this challenging new role. We understand the Bible is the foundation of all knowledge--a fact hidden from this world. We know that revealed knowledge provides the purpose for which knowledge should be acquired and the guidelines for using that knowledge. Ambassador College has not only the unique privilege of evaluating all knowledge acquired in the past, but the challenging opportunity to do pioneer work in the acquisition and proper utilization of new knowledge, as we build on the foundation of revealed knowledge.

As I discuss below, experimental research involving plants and animals is a powerful tool for discovering (but not enforcing) physical truth. It is a reliable method that has been largely misused and is without real direction. Since (as shown below)

certain types of experimental research not only appear permissible from the Biblical Record but would even seem essential to our own physical well-being, I would like to suggest some possible uses for such research at Ambassador College.

1. TO ACHIEVE OUR STATED PURPOSE OF "RECAPTURING TRUE VALUES," CERTAIN TYPES OF EXPERIMENTAL RESEARCH APPEAR TO BE A NECESSITY. In the area of education and even the ministry, God has revealed foundational guidelines but has left it to us to work out the practical details in many instances. In the area of agriculture we are experimenting to determine the best methods to use--based upon revealed principles. In printing press procedures it is the same. In the area of nutrition we recognize that "we are what we eat." In the Western world man suffers from diseases of civilization, (cancer, heart disease, etc.) that are closely associated with his diet. This diet consists of many items that God never intended to be used as food. In some cases, we have direct Biblical proof of this (unclean animals). In other cases, God has not revealed specific facts because it is well within man's ability to obtain these facts. It is in this area of "recapturing true values" of what would constitute a good diet that experiments with animals would be practical and useful.

On the basis of revealed principle coupled with knowledge of body function, we might suspect, (when the world would not), that refined foods and other items

such as coffee may not be too good for us. Properly designed studies could provide conclusive proof. That a need for such studies exists is suggested by the fact that even here at college there exists a considerable difference of opinion about various aspects of nutrition. Why should this be when we have been admonished in the Scripture to "be of one mind?" It might be pointed out that it is our opinions that differ, and they differ over information, or lack of information), that is provided by worldly research.

Should we wait for the world to provide us with information in an area that is vital to our physical well-being--when most of this world's research is based on the assumption that there is nothing wrong with our diet? If Satan is subtly using the American diet (among other things) to undermine the vitality of our country, such an approach would play right into his hands! With properly designed experimental studies we could take the lead in providing conclusive information to our own people and to the world that is not being made available by modern nutritional research!

2. EXPERIMENTAL RESEARCH COULD ALSO BACK UP WITH SPECIFIC FACTS WHAT MR. HERBERT ARMSTRONG HAS ALREADY STATED IN PRINCIPLE BASED ON REVEALED KNOWLEDGE. The Bible reveals sickness is the result of sin--which means broken laws. The Bible does not reveal all the physical laws involved, but it does reveal fundamental principles

we can use to determine what laws are being broken and thus PREVENT sickness by OBEYING those laws!

We could do research at Ambassador that would conclusively link many of our modern diseases with aspects of our modern life style (refined foods, lack of exercise, etc.) that the average person assumes are not detrimental to his health. The reason for this assumption, by the average person, is that the effects do not become readily apparent until it's too late, in many cases. This also speaks of the subtlety of Satan's methods.

Our research would not be to induce a lot of diseases in animals as the world does. Our emphasis deliberately would be to show whether or not some items we may suspect to be harmful (on the basis of revealed principles) really are harmful, or not. Secondly, instead of looking for cures, we would be looking for the effects on vital cell functions of diets which are considered wholesome by the average person (such as refined foods, soft drinks). Our purpose would not be concerned so much with what disease was produced, but rather with whether or not physical laws are being broken at the cellular level --which is the very basis of the disease process.

Our basic approach would therefore involve a completely different concept than is now generally practiced in medical research today. The emphasis

would be on prevention of disease through obedience to clearly demonstrable laws. This approach is in total opposition to the world's emphasis on developing cures (drugs, artificial organs) that encourage breaking laws and foster ignorance of laws.

3. INFORMATION GAINED THROUGH EXPERIMENTAL RESEARCH COULD ACTUALLY BE USED IN FULFILLING PART OF OUR COMMISSION

OF SHOWING ISRAEL HER SINS (ISA. 58:1). God reveals that His people are destroyed for lack of right knowledge (Hosea 4:6). Prophecies indicate pestilence and disease will constitute a major sign of the coming end of this age (Matt. 24:7). Does Rev. 6:7-8 reveal these disease epidemics will be totally supernatural in origin, or that God is going to allow our own disobedience of physical laws to correct us--as Lev. 26, Deut. 28 and Jer. 2:19 would indicate? If the latter is true, the world has yet to be told in a convincing way. Prevention Magazine won't suffice.

4. RESEARCH IN THE FIELD OF HEALTH, DIET, AND DISEASE PREVENTION WOULD ENABLE US TO SPEAK WITH AUTHORITY IN A FIELD WHERE THE WORDS OF THEOLOGIANS CARRY VERY LITTLE WEIGHT. Medical science and industry have

found that the "research team" is the most powerful approach to problem solving. We have on our present faculty men with research training in anatomy, bio-chemistry, physiology, pharmacology, microbiology and pathology. In other words, we have the personnel and much of the equipment already on hand to put together a "research team" that could make significant

facts available using revealed knowledge as a foundation. I think we could make information available for radio, TV, and our publications of a quality that not only the general public but also the medical profession would have to acknowledge as being true whether they liked it or not.

5. PRACTICAL, POSITIVE, PROPERLY DIRECTED RESEARCH WOULD GIVE ADDED PRESTIGE TO AMBASSADOR COLLEGE.

Nutritional research aimed at determining what foods were intended to be eaten as well as how to properly prepare food would have immediate practical application to show that we are concerned for the health of the people in this world.

By pointing out how cells function and how disease begins (some things here are still unknown and need to be discovered), we would be able to do our part to help people avoid some of the plagues we know are coming.

Other experiments could be directed at disproving claims of evolutionists with facts we have discovered and demonstrated ourselves. The most effective weapon against evolution is scientific fact--not theological argument. Not that science is all-powerful, but power is available through science that religion has failed to take advantage of.

Most scientists look down on religious institutions as being afraid of science. This is probably due in part to the stifling influence of religion on the growth

of science in the past, where the item in question was authority. The results of this struggle have been detrimental to both science and religion. Science and religion should complement each other, since they deal with two types of revelation--physical and spiritual --of the mind of God (see Dr. Hoeh's comment).

It remains to be shown that a college founded on TRUTH is the only place where the proper roles of science and religion can be ascertained and merged harmoniously and productively. Herein lies the fantastic potential for Ambassador College in this area.

BIBLICAL BASIS FOR EXPERIMENTAL RESEARCH

I would also like to comment briefly on the use of plants and animals in experimental biological research. By animal research I am not referring to the abuses and excesses of this method that may come to mind. I am referring to research that could be conducted on animals in a humane manner, where no torture is involved. This type of research (such as dietary studies) would be done for the PURPOSE of gaining factual information in areas where such knowledge has not been revealed, and where the possession of such knowledge would contribute to man's physical, mental, and spiritual well-being.

In answer to the question "Would it be right or wrong to do research on animals?", I would again like to refer to the Biblical Record to see what God permits by way of example concerning the use of animals. Chapter one of Genesis reveals that God gave man dominion over the plants and animals. Man was to "dress and keep" the earth and to care for the animals in a humane manner

(Prov. 12:10, 27:23). Man was also given the prerogative to take the life of animals.

Genesis 30 records that Jacob used selective breeding techniques to improve his herd. Several pertinent questions about this example might include: Is not this an experimental situation? How was the knowledge that Jacob used acquired? Through practical experience--hence experimentation? Or did God reveal this knowledge? Jacob's experiments involved only cattle--clean animals. Yet we conduct similar breeding experiments with dogs, cats, horses and think nothing of it.

Another example might be worth mentioning here. Daniel, who was skillful, cunning in knowledge and understood science, voluntarily subjected himself to a dietary experiment to prove a point (see Dan. 1:8-16). From the context this appears to be Daniel's idea, since God did not instruct him to do this. Daniel also apparently knew what the outcome would be because he seemed quite confident from the outset. Daniel used physical evidence to clearly demonstrate a point to carnal people. Is not God going to use similar methods in the Millenium (Zech. 14:17-19)?

In a practical sense, we are using this experimental approach on plants, animals and ourselves almost every day. On our campus here in Pasadena, the Gardening Department has been experimenting with various types of natural fertilizers to see which ones produce the best results. They also made a comparative study of the effects of natural vs. chemical fertilizer on plant growth in an experimental garden plot. On the Texas campus, chickens are being fed various diets to see which produces the best results. I understand that when the chickens are killed, their internal organs will be examined

also as a matter of course. We also perform simple experiments on ourselves when we attempt to determine which foods give us indigestion, gas, etc. When we identify the offending item, we remove it from our diet to prevent future discomfort.

God commands us to prove all things, to search things out, to grow in knowledge. In some areas, God has revealed knowledge so man does not have to learn by experiment and experience. In other areas, God only give principles and guidelines for man to use in acquiring knowledge.

Can we then conclude from the Biblical examples mentioned above and from what we presently allow that the principle of experimentation for the purpose of gaining specific factual knowledge in areas not covered by revealed knowledge is permissible, practical, and essential? Can we conclude from these examples that humane experiments on plants and animals for the purpose of gaining information that will enable man to better keep both the spirit and the letter of God's law are also a prerogative of man? Would Jacob's practice of selective breeding along with what we presently allow provide sufficient evidence that experimentation on plants and animals is permissible within limits? Would Daniel's example of a dietary experiment and Moses' instructions in disease prevention provide direction for certain types of experimentation?

POWER OF EXPERIMENTAL RESEARCH

Another question to consider would be: if God does not prohibit man from doing certain kinds of experiments with plants and animals, what is it that man could learn from properly directed studies? Why would man want or need to resort to plant or animal experimentation?

The problem is basically this: Man is a physical being. To "be in health and prosper," man needs to know certain practical physical facts. The Bible makes no claim to be a complete physical revelation, but it does give principles in this regard. God gave man a mind so he could search out physical facts according to the guidelines in the Bible.

The scientific method of observation and experimentation through repeatable testing is a powerful and reliable method (within its limitations) of discovering facts. Applied to plants and animals, it can be used to gain factual information as to how living organisms function under various conditions. It can be used as a practical tool for illustrating the cause and effect principle. Since either the positive or negative effects of a specific cause can be observed repeatedly through experimentation, it is also a practical method of determining physical truth. As such, it can be used to discover physical facts and laws which have not been revealed in the Bible. (Facts and laws that we would suffer from if we broke them or used them improperly).

Experimentation on plants and animals can also be used to determine whether or not physical laws are being broken in a specific situation. In such circumstances the experiment becomes a neutral arbitrator that supplies facts that preconceived ideas and opinions would have to give way to.

By using properly controlled experiments on plants and animals, man could prevent some of the costly mistakes that people are now paying for with their lives!

DISSECTION--CLEAN ANIMALS

Since biological research often involved dissection of plants and animals, I would like to examine the question, "Should

we, or should we not, be involved in animal dissection?" Is it right, or wrong? The way I would like to approach such questions is to look into the Bible and see what God specifically permits by way of example. The Biblical record indicates quite plainly in Leviticus that the Levites had a rather extensive knowledge of the anatomy of clean animals. This was required for the proper preparation of sacrificial animals. The Levites, after killing the animal, had to be able to recognize specific organs which they were to burn on the altar (the fat covering the inwards, the two kidneys and the fat covering them--which is different from the rest of the fat in the body, the caul above the liver, etc. The rest of the animal was to be burned outside of the camp.

In essence the Levites had to cut up animals--call it butchering or dissection. They must have also examined the organs before offering them as part of the sacrifice because the animals were to be without blemish. It is quite possible for an animal to appear healthy from the outside and yet have tumors, etc., easily noted in the internal organs.

I think we can safely conclude from the Levitical precedent that neither the principle of dissection of clean animals nor the knowledge of their internal anatomy is wrong. Again, in keeping with the spirit of the law, the animal should be killed in a humane manner so as to endure no torture. The dissection should also serve some useful purpose.

DISSECTION--UNCLEAN ANIMALS

Since much of the dissection done today involves unclean animals, we should again ask what God permits by way of example in this area. Are unclean to be excluded from such study?

Leviticus 11 states that we should not touch the carcass of an unclean animal. One reason, as Mr. Lee points out below, is to avoid picking up some disease from the putrifying carcass. Another reason the Bible reveals is to set the Israelites apart from surrounding nations. This injunction did not prohibit touching unclean animals that are alive, because Isaac rode a camel (Gen. 24:64) and Christ rode a donkey (Matt. 21:5). I think we can safely conclude here that it is not wrong to touch an unclean animal while it is alive.

The Bible also records examples where men took the lives of unclean animals. David killed a lion and a bear--apparently with his bare hands (I Sam. 17:34 and 35). One of David's mighty men, Benaiah, also slew a lion (II Sam. 23:20). The context would allow that this was with his own hands. Samson, with the spirit of the Lord, killed a lion with his bare hands, returned some time later and took honey from the carcass and ate (Judges 14:5-9). The jawbone Sampson used to kill 1,000 Philistines was "new" or "moist" (Judges 15:15). Was it from a donkey he or someone else had just killed? Saul was instructed by God to destroy Amalek--men, women, children, clean and unclean animals (I Sam. 15:3).

Here we have clear examples where men with whom God was working felt no qualms about touching living unclean animals or taking the life of unclean animals. In no case (with the exception of Sampson and the honey?) did they touch the putrifying carcass of an unclean animal. Nor did they EAT the unclean animals. They did not touch something that died of itself or that was torn of beasts.

Man has used unclean animals down through history in various ways; as beasts of burden, for transportation, for pleasure, and as pets. These practices do involve touching unclean animals, but

not taking their lives. We also use unclean animals in ways that not only involve taking their lives but also touching their dead bodies. To make fur coats we kill and skin camels, mink, and beaver. To make shoes and accessories, we kill and skin alligators, pigs, snakes, etc. Are these practices condemned in the Bible, or would the above Biblical examples allow such practices?

Can we not conclude from these examples that God has given man the prerogative to take the lives of clean as well as unclean animals? If man is permitted to kill and skin unclean animals, why could he not examine the organs of that animal if the knowledge he gained thereby would be useful and practical?

CONCLUSION

My purpose has been to discuss the principles involved in experimental research and dissection as well as the potential value of such methods if incorporated into our academic program.

Experimental research on plants and animals has been shown to be a powerful tool for discovering and illustrating physical laws, but it has been abused and misused. Most medical research is directed toward finding a "cure" for disease--which is merely trying to usurp God's prerogative to heal--or learning how to "overcome" various natural laws to avoid paying the penalty for breaking them. Properly directed research could discover when laws are being broken and provide information that would enable man to live more perfectly in harmony with those laws and thus prevent many diseases.

Concerning the matter of dissection, I feel that the major emphasis it has been given in biology classes of this world is wrong. Biology should be primarily a study of the living--not the dead. Dissection of plants and animals for the purpose of gaining

useful information about physical laws and how to live in harmony with them would seem to have definite merit.

Both of these methods of investigation can provide useful and practical information. The crucial issue involves the purpose toward which they are directed and used. Ambassador College could make significant contributions in the field of improving health and preventing disease through properly directed plant and animal research--essentially because the world is looking for the "cure" and not really trying to find the "cause" or identify the LAWS that are being broken.

MR. LEE: What forms of dissection have we carried out at Ambassador College?

The class primarily involved with animals is Animal Biology. Here we study into both clean (by far the minority in the animal kingdom) and unclean animals. In the class, I have found no occasion to dissect unclean animals. Whatever we need to learn from them can often be learned from clean animals just as well. Furthermore, we find that there are transparent models of many unclean animals that we can buy and use in class. These will demonstrate the internal structure of the unclean animals even more clearly and interestingly than with the actual dead animals. To make the class more interesting and realistic, we exhibit to the students from time to time live as well as dead animals. Many of these animals are unclean of course.

In the Bible I find that when a person touched a dead body, be it a man or an animal, he became unclean only until the evening. It is not a matter of sin--but sanitation. Furthermore, the products from many unclean animals (e.g. hide and fur) do seem to be created for man to use. I take the Bible's instruction in Leviticus 11 to mean not to touch the putrified carcass of unclean animals, and not: not to touch the dead animals period! We use products such as oyster shells to feed chickens, stuffed animals for display, crocodile skin for shoes.

But should we dissect animals at all?

In the class we dissect clean animals, FISH. We do this with a reason. Soon after the fish are dissected, we take them to the kitchen, and drop them into the frying pan. Then we eat them. Our dissection serves not only anatomical but gastronomical purposes!

DR. HOEH: We would like to have an important discussion on this matter which really is the foundation of progress, but before I open it up to that I would like to draw attention again to Dr. Kuhn to the positive impact. We too often have been dwelling on the concepts of theology versus evolution as distinct from the overall relationship of both. And I think in analyzing what Dr. Winnail said: that science as taught at Ambassador, and theology as taught at Ambassador, should point up the extent to which science has missed its goal and theology has wandered in total darkness in the world. And there is a time to play up one side and a time to play up the other, and the contribution or the lack of it.

In a sense I would like to point up that it is not exclusively that science must look to theology because theology is a science when we actually understand it. Rather, we are dealing with the study of two areas, one of which is a revelation, the other of which is a revelation. One being a spiritual revelation, the other a physical revelation, both of which define in one way or another the powers and the attributes of God. It is not a question here of authority, that is, that all theologians are over all scientists, but that science (as we conceive of it or the various departments of science and theology) are both, shall we say, handmaidens (to use the traditional term) in the study and the apprehension of the knowledge and the mind of God.

And it is equally important for a theologian to recognize that in the area of science he must consider that a scientist may have much more knowledge on a particular subject, and vice-versa. We happily have here in the audience at least two

who are elders. I can't say how many I could--well three, there's Oberlander I guess--there's several, whether three or four, I would have to consider; this is as it should be.

Before we enter into a discussion I should like to point up now as the initial part of the discussion a reflection of the theological faculty, but not all of them necessarily. Some of you may have comments. I would like to give the positive and negative views, which might cut down needless discussion here to start with. There are certain premises stated in the Biblical records: if God is the Healer, then necessarily there are certain things that man does not need to know; there are other things, on the other hand, that man should know to prevent the sickness in the first place. We were given an illustration which I think was very properly stated. One of the functions of the priesthood was the slaughter of animals for a religious purpose. On this premise, there can be no prohibition stated in the Bible for the proper utilization of clean animals in dissection, provided that such slaughter of animals is no less humane than the ordinary butchering of an animal we eat. No case of torture is in any way approved in the Biblical record just as Dr. Winnail has mentioned.

The question, however, of unclean animals, I should like to point up, is at least in part defined in the Scriptural record as that "you should not touch them," bother with them; and medicine, which has been the ultimate goal of much, is predicated on what we may properly call "rat science." That is the study of the unclean rather than the clean, and I think we should evaluate whether the whole concept of medicine has warped the purpose for which

biology should be involved, and that what we are seeing here is a perversion of the original intent. For instance, if I were, or Mr. Herrmann were, to butcher an animal and our children were there, there would be things we certainly would explain. Certainly a Levite had to have some knowledge explained to him in order to know what to remove or what was to be the offering, but in no case did you cut the animal piece by piece until he died. The function is to put the animal to death. Man to the animal is God because God gave to man the purpose to take life and also to provide an opportunity so that the animal may give birth.

Now man has not been given this prerogative over man. Therefore it is not man's function in my estimation to dissect other human beings. I do not want this in any way to define for all times the purposes and the functions of science, nor is this to be discussed outside, but I have pointed up certain Biblical indications as to what we do than would be determined circumstantially, also financially.

I would like to open it up for discussion. If you'd just raise your hand I will see that if this required more explanation, if not it is quite all right. Some of you might like to remember your own notes if you would in the area of comment. First, I think we should call on Mr. Hermann.

MR. HERRMANN: A short comment here with regard to the dissection of unclean animals. My wife and I searched out this problem from a Scriptural standpoint some ten years ago, whether men dealt with any portion of a dead unclean animal. Our fossil collection was obviously at stake, but the item of immediate concern at the time was our proposed expansion in biology. We found a number of cases in the Scriptures, one where the jawbone of an ass was used rather effectively. Another was the fine quality coat made of camel's hair worn by John the Baptist. Honeycomb was taken from the dried carcass or bleached skeleton of a dead lion. The only other example we could locate was the use of badger skins in the building of the tabernacle as a decorative item. Yet commentaries give the conclusion that these were not badgers as we know them but rather a clean fish. The skins of this fish were durable and commonly used to make a fancy type of sandal.

Our general conclusion was that bones, shells, hair, the dried parts of an unclean animal were apparently no problem but we found no liberty to go further than this.

Footnote: One member commented after the meeting that the "pearl of great price" might also be added to this list, pearls being the products of oysters, which are unclean.

DR. HOEH: I would like to cite the case where I took a little girl to a doctor who took four different x-rays in order to find out the problem, then called in another doctor who actually set the bone while I was there. And then the first doctor took four more x-rays. The function, of course, of x-rays here was to provide a proper billing. The doctor who set the bones looked at the first x-rays and found they were useless. He actually felt the arm, set it and he had no reason himself to look at it again, that is by the touch. He didn't have to cut in or anything; in some cases it may be done, but I think a great deal of knowledge can actually be acquired without many of the things that are done by medical science. And certainly a man who is skilled would be able to convey knowledge.

Now I do feel that Mr. Herbert Armstrong would without a doubt bring into question the idea of cutting up human bodies. I think, on the other hand, that we may definitely find information that is involved in the cutting up of animal bodies as such, whether we use the term dissection or whether we use the term butcher (however people sacrifice); these are only different terms you know.

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DR. ERLANDER: There are two questions which I would like to bring up: (1) Why do scientists use rats for experimentation? and (2) Is there any Biblical law which forbids the use of "unclean"--or even clean--animals for experimental purposes as long as these animals are not put through any circumstances where they will suffer? With regard to the first part, rats are, of course, quite inexpensive because they reproduce themselves at a good rate. However, so do rabbits, and most likely even to a greater extent than rats. But rats have a digestive and metabolic system which is very similar to that of man's. An important point is that metabolically man can be considered as an "unclean animal." Because of this, sickness in man cannot be properly investigated by examining only clean animals. Hence, rats are used today to investigate such sicknesses.

Now with regard to experimentation on unclean and clean animals in a proper painless way, at present such scientific experimentation is being done on an extremely limited scale in Texas. The Agricultural Department at Ambassador College is, I am told, using chickens to investigate the health of vegetables grown on different types of soil. I should add that unless scientific equipment is used in conjunction with these experiments, to study the changes in tissue, then their results will not have much meaning.

A further point should be mentioned. If there is a restriction in experimenting with only those animals which are mentioned in the sacrifices (and of course, the sacrifices were not used for experimental purposes), then not all clean animals may be used, but only those which were designated by God. Now before the Levitical priesthood, man sacrificed what was somehow

told to him to be right. But even here, not all things were acceptable to God, because God accepted Abel's sacrifice but not Cain's. After the institution of the Levitical priesthood, only specific clean animals were allowed to be sacrificed and only Levites were allowed to give this official ceremonial sacrifice. Thus doves are mentioned, but not chickens. Clean fish are never given in a sacrifice. Consequently, if a restriction is held to only those animals stated by God for the services of the Levitical priesthood, then many clean creatures must be eliminated. Furthermore, Noah had to feed both clean and unclean animals on the ark. Certainly he may have experimented with them with regard to what food he should feed them. And he may have touched and removed the dead carcasses of both clean and unclean animals. That is, certain unclean animals such as the rabbit reproduce quite fast and there is a possibility that some of this offspring--or even the original--may have died, since others would remain to carry on the species.

The question therefore arises as to whether unclean animals can be killed by man, and if killed, can they be handled after their death? As pointed out by Mr. Lee (see below), the only purpose implied in the Bible is that we should not touch unclean (or even clean animals) when they have died of themselves, because such a death is most likely accompanied by some disease. Or perhaps the fleas on the body of such a previously sick animal may transfer to the handler toxic bacteria, as in the case of bubonic plague or some similar infectious disease.

Not it is known that unclean animals represent the Gentiles, whereas clean animals represent the Israelites, as shown in Acts 10:12-35. Thus we must become spiritual Israelites before we are

acceptable living sacrifices. In order to illustrate this, unclean animals (as a representation of the Gentiles) were not offered as a sacrifice by the Levitical priesthood. It would appear that this ceremonial concept was further emphasized by that law (Lev. 11:24-28) which states that one becomes ceremonially unclean by touching the dead body of an unclean animal. Note that except for animals which die of themselves, nowhere in the Bible does it state: You shall not touch a dead unclean animal. Rather, the command is that if or when you do touch such a dead animal, then you are ceremonially unclean. In other words, if this law were written for the purpose of preventing people from touching unclean animals which they have killed, then it would seem that God would say point blank: You shall not touch! Such a command is not given. Thus it would appear that this law concerning the touching of unclean dead animals is a ceremonial law which perhaps illustrates that we are spiritually unacceptable if we go back into the world.

In summary, the Bible states that we become ceremonially unclean when we touch the dead body of an unclean animal which we have killed. But the Bible does not state that we should not touch such a dead animal. Furthermore, the Bible does not state that we can do experimentation even on clean animals. And not all clean animals, such as chickens, were acceptable as offerings under the Levitical priesthood. Moreover, many people are conducting their own experimentation on themselves with respect to what they should or should not eat because they have lost the knowledge of what is a food and what is a poison. As a result they are sickly, or are dying. Why not conduct such experiments on less worthy creatures such as the rat, as brought out by Dr. Winnail? I see nowhere in

the Bible where such experimentation would be against God's direct words or against His principles.

NUTRITION AND LABORATORY METHODS USED IN TEACHING
DR. ERLANDER

Because of the limited preparation time, I believe that Dr. Hoeh's idea to submit footnotes to our speeches was an excellent one. Therefore, I would like to expand further on what I said at this meeting by using such footnotes. I hope that this will clarify the points that I have brought out here.

There are some questions which I would like to raise and also comment on, first of all, what research has to do with teaching and how one should teach students in the laboratory as far as chemistry, physics, and other scientific types of subjects. I will also go into the teaching of nutrition and what types of laboratory methods should be used there.

To teach science, you must get across to the student two factors: what a scientist can do and what a scientist cannot do. The student must understand the limitations of the particular science. At Ambassador College it would seem that the negative approach has been stressed, what the scientist cannot do. But what can he do with his instruments? How good are these instruments in the particular type of work he is doing? The scientific world has a method of correcting itself. Scientists in chemistry and related fields correct themselves. They do not want other scientists to ridicule either them or the journal. A scientific paper must first be accepted by referees before it can be published. In addition, a scientist, in order to further his own name, will seek out errors in papers published by others. You can find this out by just reading the literature. An important aspect then is to find out the accuracy of the application of scientific method in modern research. What

a scientist can really do is not yet grasped, I think, by most people at Ambassador College.

In addition to learning the limitations of scientific research, the good student should do research in order to study and understand God's creation. God is the greatest scientist that has ever lived and is living. Now since He is a scientist, then what has He done? What are the various aspects of the creation and why not use creativity to understand what God has created? In other words, research into God's creation would instill in your own mind God's creativity. But, it is also important to find out what can be done scientifically. In other words, we should try to understand God's creation from the viewpoint of what has already been discovered and not to just have the approach that the scientists are always wrong.

To do research, we should not ignore what the scientists of this world have already discovered. Why should we go back to the Dark Ages? We must, therefore, investigate what has already been discovered and build on that knowledge which we discern to be correct. We cannot assume that everything scientists have discovered is wrong. We must try to find out for ourselves what is right, and what is accurate.

Teaching science should not be on a high school level. It is discouraging to the students. A number of students, who have come to me, stated that they do not want to take science courses because they realize that Ambassador College does not teach above a high school level. And many students will not come to Ambassador College until they have had science in other schools. Now whether you know this or not, I don't know, but I know it by

talking to other students. I've found out, for example that some who have graduated from Ambassador College know nothing whatsoever about science. There is one fellow I talked with who had just graduated from Ambassador College and I was telling him about DNA, and he said, "What's DNA?" He did not even know what "DNA" meant, yet he had graduated from the college. Today high schools are so geared that students who graduate from a good high school have such knowledge even before coming to Ambassador College. They don't have to take Ambassador College science courses in order to learn such physical knowledge. In other words, what I'm saying is that we should upgrade the science courses for those students who have had the background. In other courses, the poorly prepared students should be given courses which can at least prepare them for the same type of courses that the more advanced students begin taking. At least such students should understand some of the things which science has discovered already.

The more advanced students should not be discouraged from going into learning more about science. These more advanced students might be future writers for The PLAIN TRUTH or TOMORROW'S WORLD. We are not going to be able to fight the doctrines of evolution unless a proper body of scientific knowledge is first obtained. They are not going to be able to disprove evolutionists unless they have all the facts. If we have writers who write on topics which they only know slightly, then errors will be introduced into the articles. Such writers should be first taught in specific fields so that they can have the best possible foundation.

Another aspect is that the purpose (Footnote #2) of teaching science in the laboratory is the building of creativity. And you cannot do this unless you are going into the unknown because when everything is on the "cookbook" style, then a student does not really think about what he is doing. He goes into the laboratory, carries out an experiment which is given to him in black and white, and then quite often gets the result which has been predicted--so what? Such laboratory methods are necessary in order to teach techniques, but the advanced student must go further than this. To be restricted to just learning the proper laboratory technique is not encouraging to him. Without studying the

Footnote #2

In order to fully develop the brain, a man must be creative in his work. Thus, an architect creates a design for a building, the engineer creates the structural soundness of this idea, and the carpenter or mason uses to some extent creativity when he places the material in its order or when, as in some instances, he finds the engineer to be in error. If we exclude the direct, explicit laws (the "Thou shalt not" scriptures), then creativity is also used by the Theological Department here at Ambassador College even though the entire project is inspired, directed and concluded by God. Thus an idea or theory is developed and scriptures are checked. The net result becomes a law, if it is seen that the principle and "works" are good, as, for example, whether or not a Christian should smoke. Experiments ("works") conducted with smoking show that there is an ill effect. Also the principle of smoking is self-satisfaction, which is contrary to scriptures. Consequently, the Theological Department here at Ambassador deals with developing ideas or theories. Sometimes this theory is wrong as occurred in the case of the four consecutive 7-year periods thought to be in Leviticus 26. However, because of its association with the "theory" of evolution, the word "theory" concerning scientific concepts is ridiculed extensively at Ambassador College. But the creation of theories is a necessary concept in the development of the human mind. My point is this: The science departments should be allowed to develop creativity in their minds--and consequently, in the students' minds as well. If the theologians have this privilege, then I believe that the other scientists should also. Scientific research in the science departments should therefore not be sneered at or looked down upon but should be allowed to develop here at Ambassador as a necessary educational tool. At present it is almost totally absent at the college.

unknown, creativity cannot be instilled into the student in the laboratory. As a result, he has no incentive to really delve into what God's creation is. In a sense he thinks: Here it is in the book--why should I go into the laboratory, and so forth? "Why should I learn science?"

Right now there are some students who are doing scientific research here under my direction as well as under others. They are, I feel, learning creativity. And I find that some of them initially did not understand what creativity is. For example, a student was told to dissolve a sample of DNA in a specific solvent. He asked me: "How should I do it? Will it react with the salts present? What will be the maximum solubility?" I said to him that I didn't know the answers to these questions--and to my knowledge neither did anyone else. The student has thus become so accustomed to doing "cookbook" experiments that he needs guidance at each step. He is incapable of doing creative research even on a small scale. Creativity must be developed in the mind. It is not just a matter of learning new facts. But creativity, which in the sciences involves learning about God's creation, is needed for developing the student's mind. The individual must be inspired to think for himself--to meditate, if you please--about a specific problem. In other words, we are created in the image of God, and this involves also the ability to think creatively. The only physical creatures on this earth who can think creatively are human beings. And such thinking should be instilled in the mind of the students. And this, I think, can be done by having a "creative" scientific research. And if they do, then this also forces them to understand what the scientists of this world have

done, what their limitations in research are, and so forth. This will provide the basis to write properly about science, and to demonstrate errors of the evolutionists. Ambassador College should bring science on our side, and point out that evolutionists are really not scientists, but philosophers.

God's creation is so complex that one man can not master all of the sciences. Thus, even in the specific field of chemistry, God's complex creation is manifested. And the way that man has divided the different fields of chemistry has actually, I believe, been done well, because man looks at the physical. Inorganic chemistry, for example, can be a study of the composition of soil, rocks, and salts; a study of how these components interact in water or other solvents; and so forth. Qualitative analysis is a particular field of inorganic chemistry. It is a determination of the components present in a given sample. This subject is also taught at the Texas Campus. Such a study is extremely important in order to illustrate to students the different properties of minerals.

After the student has finished this course, then he is prepared to go to the next one, which is quantitative analysis.

(Footnote #3)

Footnote #3

As mentioned by Mr. Deakins and by Dr. Hoeh below, prerequisites should be placed on the science courses in order that the proper level of science can be taught in that course. This is already being done in the chemistry department. Thus in order to take the advanced courses, a person must have taken the equivalent prerequisite at another college--not at a "super" high school. But such prerequisites cannot at the present time be imposed on all of the science courses. If they were, then there would be no students for some of the classes. This is because there are not a sufficient number of electives that are required in science. If the number of theological courses is maintained at the present

This course involves instrumentation. At the present time we don't have such instruments, but we are trying to get some of them. In quantitative analysis, the student learns first hand what the limitations are, for example, in determining how much mercury is present in a fish, or how accurate one can detect trace elements in plants, the earth, ores, salts, and so forth.

Organic chemistry is another field which has been investigated by the world; it is an important field. It involves such studies as agriculture and nutrition, since organic chemistry is the study of complex carbon compounds.

Another field of chemistry is physical chemistry. This field is extremely important. The laws of thermodynamics are explained in this course, and these laws prove that God exists. All of these subjects can be used to understand God's creation and also to prove His existence. Physical chemistry then is the application of physics to chemistry. And physics is important as Mr. Hegvold has just pointed out. However, the student, I feel, should learn more than just a high school knowledge of physics

Footnote #3 con't

number, then the only solution is to increase the number of years for a bachelor's degree. That is, at the University of Minnesota and some other schools, a person must take a full load of classes for five years before receiving both B.A. and B.S. degrees. This extended program has resulted, not because of an increase in the number of science courses, but because the administrators felt that the science student should receive a more well-rounded education by taking courses such as history which are outside the fields of science and engineering. At Ambassador College the only way I feel to circumvent the problem without cutting some of the theological courses is to give a five-year course with two majors and two degrees: one in theology (B.A.) and the other in another particular science field (B.S.).

and chemistry. (Footnote #4)

At this time I should also state, as I believe Dr. Hoeh and others have stated previously, that as teachers God can give us wisdom in our work. Certainly God gave wisdom to those who were underneath Moses (as recorded in Exodus 28:3; 31:3,6; 35:31; 36:2; and other places). But note that God did not give this wisdom first to Moses, who then in turn gave this wisdom to those underneath him. But God gave specific wisdom directly to those who were teaching. God did give wisdom to Moses to direct the entire work, the same as He has given to Mr. Armstrong. But to us as teachers, God can give wisdom in our own fields. (Footnote #5)

Footnote #4

One point that should be brought out here is that in order to excel in something, you must specialize! At Ambassador College, scientists are continually being criticized for being specialists. The picture that is painted is that a scientist when brought out of his cocoon is completely lost. This is a false picture for most scientists. But there are exceptions. But how about other specialties? Couldn't they be attacked in the same way? Consider, for example, those who work at the press at Ambassador College. Or what about those in the Art Department? The Engineering Department? The Gardening Department? And are businessmen or salesmen excluded or are they also limited in their knowledge? A true specialist is not an assembly-line producer. Rather a true specialist even in the field of chemistry must have a vast knowledge and understanding of related fields. And scientists recognize this.

Footnote #5

If God gives wisdom, understanding and knowledge to the scientists of His work, then could such wisdom be acknowledged by the world? The world recognized the scientific wisdom given to Daniel and his companions. Also it recognized that wisdom given to Solomon and to Abraham. This wisdom is physical--not spiritual. And since it is physical, then the world can recognize it. If physical wisdom has not been given, then it is quite apparent to the world. In my own experience, scientific men will honor me for some physical wisdom given to me, but will hate me for the spiritual wisdom which God have given to me. Does this contradict the scripture which states that you should beware when the world thinks highly of you? Not at all, because the world as a whole

At the present moment there are very few science students at Ambassador College. This has occurred primarily because of two reasons (see also Footnote #3): First of all, those Ambassador students who are scientifically inclined think that we have nothing to offer. Consequently, they conclude that since they already know all of the material to be covered, they do not want to waste their time and money just to obtain science credits. As a matter of fact, one of the students in my class related to me that he was very disappointed in the content of his first science class at Ambassador College, which by the way, was physics. He thus

Footnote #5 con't

will never speak highly of any person who holds the true religion. In other words, if the world is to look down upon you because of your profession as well as your religion, then none in God's Church could excel or even attempt to gain any sort of skill, whether it is in printing excellent pictures in The PLAIN TRUTH, in carpentry, in news-broadcasting as in the case of Mr. Garner Ted Armstrong, or in newspaper advertising and news-broadcasting as in the case of Mr. Herbert W. Armstrong. Yet both of these men are still excelling in these jobs. And these skills, as shown by the substantial offers given in the past to them, are recognized by the world. Isn't then the persecution of any of us to come on the basis of our religion rather than on the basis of any factor connected with recognition? I think an understanding of this should be made with regard to us as science teachers. Do we have to go to mediocrity in our profession so that we will not be accepted by those in the world who are in the same profession as we are? If we do, then as scientists we would have no authority to denounce evolutionists because we must write to the world, not just to those in God's Church. And why should the world recognize anything we have to say on evolution if we cannot qualify as scientists? Does a carpenter try to do the ugliest job that he can so that he can be "persecuted" and looked down upon? We have a job to fulfill and we must do our best. Yet what is the situation here at Ambassador College? If any person at Ambassador has any scientific ability and is recognized as such by the world, then many here think that there must be something wrong with that person--and he is dutifully ridiculed for excelling. Thus there is the creation of an anti-intellectual atmosphere which, in turn, affects the students. The best way for us as scientists to develop our professional skills as teachers and to have these skills recognized by the world is to do research. We now are getting some equipment which will help us do just that. But we need more equipment to do this job.

concluded that if this is what they teach at Ambassador College, then he did not want any more of our science courses. (Footnote #6)

Now the second reason for the low enrollment in the science courses is that science at Ambassador College is looked down upon. Possibly this is because of connections of many scientists in the world with the theory of evolution. Yet the two disciplines are completely different. But, nevertheless, the correlation has been made, and thus science at Ambassador is looked down upon. If you are a scientist, then you are also a crackpot. (Footnote #7)

Footnote #6

If science is not being taught at a sufficiently high level at Ambassador College, then a student will suffer for this scholastically. As stated by Mr. Oberlander, the science tests given to our students show that they excel over other Liberal Arts Colleges. Is, therefore, my above conclusion wrong? In comparing ourselves with other Liberal Arts Colleges, two things must be borne in mind: First, the average Liberal Arts student in the U.S.A. has registered as such because he hates science--that is, he cannot excel in science and thus hates it. (However, there are many exceptions to this, of course.) But Ambassador College attracts even those students who would have normally entered a science college, rather than a liberal arts college. Consequently, Ambassador students should in some cases be compared to science colleges, if their aptitudes are considered. Thus the above comparison is not valid on these grounds. Secondly, many of the students who enter Ambassador College have had previous college training. Consequently, they would have taken science courses at other colleges. Again, therefore, the comparison of Ambassador College students with other liberal arts colleges is not valid. Therefore, I feel that my conclusion that we need to upgrade our science courses is a valid one. I have been told by one student that this is the first "converted playboy" school he has heard of. There is no pressure to study. But as brought out above, the beginning course for new students should vary according to their ability. Consequently, in chemistry, a student who enters without any previous college chemistry and who does not desire to pursue chemistry as a major or minor should take a course such as Fundamentals of Chemistry 101, which is designed primarily for Home Economics students.

Footnote #7

I would like to put forth my ideas at this time as to why this situation has developed and is still prevalent at

If one considers some of the policies put forth here, then it is apparent that there has been a fear of scientific knowledge as in the past. And as mentioned, this policy most likely developed because of the false association between evolution and true science. I have been told that in the early history of Imperial Schools, all science books were banned from the classrooms. Consequently, the science teacher had to teach science without the aid of the textbook. Controversies also arose which could not be

Footnote #7 con't

Ambassador College. In order to do so I will have to use a parallelism which is not properly accurate, and please forgive me for doing so. Nevertheless, it serves to illustrate the point quite vividly. Consider first the attitude of the Roman popes toward scientists. What actually happened can be summarized into three points:

(1) The popes propagated the idea to the people that they had revealed knowledge not only in the theological or spiritual realm but also in the physical world. Thus whatever they spoke concerning these two categories was truth. If they were proven wrong on some physical point, then, of course, people thought that they must be wrong on the spiritual ones as well. Thus, the popes feared scientists and scientific research because they were afraid that these scientists would show that they were not infallible.

(2) The popes recognized that they must fight this situation. Therefore they fought two ways: Wherever they could, they would forbid scientific research. Yet men like Mendel on genetics continued to do research. Consequently, the production of new knowledge was snuffed out as much as possible in order to prevent being discovered as fallible. But they could not prohibit the production of new knowledge altogether. Hence, their second line of attack was to ridicule. They would state that their knowledge was revealed whereas that of the scientists was not. Thus only they possessed the truth.

(3) The above line of attack was not successful in all cases. Consequently, a new approach developed. By using the power of the church and its associated government, a scientist was forced to admit that he was wrong, even when he knew that he was right. Thus this was the case of Galileo. Consequently, by forcing Galileo to lie, the pope was able to maintain control over the minds of the masses. Actually all Galileo stated was that the earth traveled around the sun. Of course, the pope wanted the earth as the center of the universe and therefore objected to this discovery. In actual fact, the earth is at the center of the universe. Science did not contradict the pope's conclusion, but Galileo's findings appeared to do so. Therefore, scientific truth was rejected.

explained by the then prevalent concepts of how the history of the earth is connected with its surface structure. The velocity of light as measured by scientists was deemed wrong because this meant that the universe was indeed quite ancient. The age of earth rocks found in different strata or the age of the moon was questioned. Couldn't God have made this world and this universe to look old just to fool the scientist? The moon rocks have now been shown by two scientific methods (potassium-argon and rubidium-strontium methods) to give the same age: 3.6 billion years old. The formation of different strata as brought out below by Mr. Burky and Mr. Macdonald must have in many cases taken perhaps millions of years or more to form.

The point which I would like to raise is why are scientists ridiculed and belittled here at Ambassador College? Such treatment no doubt develops the present attitude of students toward both science and scientists. The side effect is thus quite apparent, but the question is still "Why?" Are scientists and science ridiculed here because of Ambassador College's zeal to destroy the theory of evolution? And if any scientific facts are discovered which appear to break down our attack on the theory of evolution, or which even contradict some pet theories in the field of nutrition, are these findings and those scientists who discovered them then also ridiculed? It must be remembered that God is also a scientist --the greatest Scientist of all. Therefore, the best possible way to attack the theory of evolution is to use the facts of science-- the truth of physical science guided by the truth of spiritual revelation. I believe that a meeting such as this, where such apparently controversial scientific facts are discussed, is possibly

the best solution of these problems.

Now with regard to nutrition, what should you teach in the kitchen? I find that those even in the Church go to two extremes. They never seem to hit it right. Some become food fanatics, which is a broad term and which Dr. Stare of Harvard University applies to anyone who even looks at nutrition. About 90% of the material in the health stores is really junk. Thus, their juicers actually refine the food. Also, vitamins are refined foods. Others seem to eat whatever they desire. "Who cares, they say. "I'm going to die anyway, so why not die happy?" But they might not die happy! The point that I stress in my nutrition classes is that we must eat whole foods! But what are whole foods? I soon found out that "raw" sugar is really refined. Chemical analysis shows that its mineral content is actually between that of white and brown sugar.

What then should be taught in the laboratory? They must, of course, taste their product. The student should learn some principles of canning. There are certain aspects of canning which I think are completely wrong and should never be done, and this I point out. For example, the canning of non-acid vegetables. Also, they can get an understanding of how cheese is produced if they make it themselves in the laboratory. The simplicity of freezing fruit is brought out where there is no nutritional loss, as in the case of freezing vegetables. How can wine be made in the home and how is it made in the wine factory? Desserts are also important. They can be healthful if one uses the correct food. Students in general consider any dessert as a perverted food. And they enjoy desserts. What I try to teach them is that by using

whole foods you can enjoy them and they still are healthful. The first desserts prepared are apple pie and baked apples. Ice cream is again a good dessert if made correctly. The students also learn how to make whole wheat bread without adding white flour. Sweet rolls, clover rolls, and pizza are also made. Meats are prepared by the students in different ways such as the braising of liver. The nutritional difference between country-fried chicken versus the Colonel Sanders' method is pointed out and applied. Mr. Clark has also shown them the different ways in which to prepare meats. Vegetables are prepared by sauteing and steaming. The double boiler method is also used. "Converted" desserts are also produced. Here the student must convert any dessert he desires to a healthful one by using good ingredients. Breakfast is also prepared such as Swedish (unleavened) pancakes and oatmeal prepared in the double boiler. In other words, the nutritional laboratory deals with teaching the student both how to prepare whole foods and how such foods taste.

COMMENTS AFTER DR. ERLANDER'S TALK
MR. HEGVOLD

Dr. Erlander brought out some points that point up the main problem I have with the science program at Ambassador College. What are our goals for science? We are supposed to concern ourselves with "basic science." What is "basic science?"

Students are not interested in "high school level" science, he claimed. Perhaps not. But just what is "high school level" science? If a student has a good background in high school chemistry, for example, I'd suggest that he take some other science to broaden his knowledge of science. As an example: A student wanted to know if I intended to offer more chemistry next year. I said that we may offer organic chemistry next year if Mr. Deakins is back by then. As it turned out, the student had already had two years of college chemistry. I asked, "Why do you want to take more chemistry? You didn't come to Ambassador College to get an education in chemistry, did you? You came here to get a broad, well-rounded education. Since you already have that much chemistry, you don't really need any more." I'd suggest that you take astronomy, or physics, or biology to get a balance in your science education."

If we were to pick a particular science, I'm sure any one of us could make a four-year curriculum in our specialty. But that should not be our purpose.

EVALUATION OF SCIENTIFIC AGES
MR. HERRMANN

Let me recount the way the Geology Department began --I arrived at Ambassador in 1948 believing in evolution and thinking, "Well, what difference does it make if God wants to produce man by having him evolve step by step through a million years or two? That's His business. To me it makes not one whit of difference one way or the other." Then we were introduced to the book The New Geology by George McCready Price, an Adventist, and other Adventist publications on problems concerning Science vs. Theology.

Professor Price presented many ideas that were totally in conflict with evolution. We followed his writings to quite an extent, but one thing we did not agree with him on--and this was a basic Adventist doctrine. (Price, I think, had different ideas that he was not fully free to present in their publications.) We did not feel that all fossils belonged to a single flood at Noah's time. Instead, we said: Look, some of these go back much, much farther into an era before man--which ones we don't know as yet.

And so step by step we began to build Geology the way it should be built. We started with the Scriptures. We said: "Look, are these 'days of creation' 24-hour days? Or do we, like Jehovah's Witnesses, presume them to be each 7000 years long?" (Some writers will say 1000.) Jehovah's Witnesses, however, will insist that they are each 7000 years long, and that the seventh day is still continuing. God has supposedly been resting these past 6000 years! These are typical of the problems we faced in those earlier years.

But know in these later years, we are tackling some even more perplexing problems in geology, and we want to air a few of them today. I wrote out some questions ahead of time and forewarned both Mr. Burky and Mr. Macdonald last night so they could come prepared.

So question number one--George McCready Price insisted that the Mesozoic Navajo formation that one sees at Zion National Park is not windblown sandstone but rather a deposit put down quickly by the swirling waters of a flood. Another deposit in the Paleozoic, called the Coconino formation, he also insisted was water-deposited.

I will ask Mr. Macdonald to comment on this particular question. "How do you determine that the Coconino and Navajo are wind deposits leisurely put down and not water deposits put down quickly? How do you justify the geologist's conclusion with regard to this supposed "wind deposit?"

MR. MACDONALD: There are a number of ways of distinguishing wind- and water-laid sandstones. The Coconino formation is a cross-bedded sandstone. Cross-bedding can occur in both wind and water deposits, but the appearance is different. On our summer Geology field trip last year, we hiked down into the Grand Canyon and examined this formation. The cross-bedding was of the wind-deposited type. Also, the surface appearance of the individual grains of sand under a microscope is different in the two types. Wind-deposited sand has a characteristic frosted surface while the grains in a water deposit are smoother. The grains in the Coconino sandstone show the frosting effect characteristic to wind deposits.

We also examined the Navajo Sandstone in Southern Utah, and the same comments can be made about this formation.

In addition to the two criteria I mentioned before, one can examine the fossil to see if the organisms are marine or terrestrial. The Navajo Formation has no fossils, but the Coconino Sandstone has tracks of land animals in it. Tracks would not have been preserved under water in the detail in which we find them, nor would you find land animals under water. Tracks of this kind are made in sand wet by rain and then covered by more sand which preserves them.

MR. HERRMANN: Would you want to comment, Mr. Burky, on the type of fossils that one would find in cross-bedded sandstone if it were water-laid?

MR. BURKY: Under non-catastrophic conditions, one would expect to find the fossil remnants of creatures that normally inhabit a watery environment. With catastrophic conditions, one could expect to find almost any type of organic fossil, but no footprints. Water that was moving fast enough to produce current bedding would surely wash out delicate footprints. (I might add that footprints could well be produced under water in a quiet shallow bay that was filling with silt or on mud flats.)

The Toroweap Formation, which overlies the Coconino, readily shows the difference between the cross-bedded windblown sand and the cross-bedded water-deposited sand spoken of by Mr. Macdonald. The fossils show a similar dichotomy. The footprints that are found in the Coconino are not found in the Toroweap. The fossils in the Toroweap are water-dwelling brachiopods and gastropods (snails) which are totally missing from the Coconino.

I would also like to point out that the surface upon which the Coconino sand was deposited was a mud surface, yet the contact line is very sharp. This would not happen with rapid

deposition by water. There would, rather, be a broad, mixed boundary. A broad, mixed boundary is exactly what we find at the top of the Coconino. Here the water-deposited Toroweap has been mixed with the windblown Coconino so that a precise contact between the two cannot be found.

MR. HERRMANN: Now, searching out the problem further, the question comes up with regard to the geologic column. We have only a local column to deal with here in the Grand Canyon area. It is a definite one and easily traced out by eye from the bottom of the Canyon step by step to the top. From this area we can go northward into Utah, upward to the Mesozoic and ending with the Eocene Wasatch deposit that forms the spectacular formations at Bryce Canyon.

The question that I am going to ask is with regard to the total worldwide geologic column, which is supposed to be 100 miles thick. In order to get such a thickness, geologists have gone around the world and picked up one stratum here, one there, another here, picking out the greatest thickness that they can find at each location--and then adding it all together to produce a seemingly fantastic 100-mile-thick geologic column. I would like to ask Mr. Macdonald to comment on the validity of this procedure, to show how it is done and to evaluate the conclusions that geologists have reached in this matter.

MR. MACDONALD: The 100 miles of the geologic column is, as Mr. Herrmann said, a composite of all the major sedimentary sequences worldwide. No one claims that the entire geologic column is found at any one location. But it should be noted that a good representation of it can be viewed in the Arizona-Utah area. The almost two miles of sedimentary rocks starting in the bottom of the Grand

Canyon represent all but two of the geologic periods. Mr. Burky and I studied this area last summer and found that there is a sequence of strata, one upon another, and that the fossils in these strata do follow the sequence they are supposed to, according to the principle of faunal succession. According to this principle, the fossils always occur in a certain definite order, and no other. From all we have been able to learn, the principle of faunal succession would seem to be a valid principle. The supposed exceptions to this order which have been brought up by creationists are really the result of thrust faults as shown by Mr. Hughes in his paper on the subject.

I'm not saying that the entire sequence of fossils is found everywhere any more than is the entire geologic column. In any local sequence of fossils only a small portion of the total will be found, but those which are found are always in the proper order.

It is important to remember that although faunal succession is used to try to prove evolution, this was not the original intent behind the drawing up of the sequence. The sequence was not assumed in order to fit in with evolutionary theory. William Smith, who did the original work on faunal succession, predated Darwin by a number of years. The sequence Mr. Smith drew up was what he observed.

Local sequences such as the one in the Grand Canyon can be correlated worldwide. To a great extent, it is possible to make this correlation by physical criteria only. Where this fails, fossils are used. The use of fossils only is justified in such circumstances because where both kinds of evidence are available,

there is never any contradiction between them.

In order to squeeze the entire history of the earth into 6000 years, creationists have to claim that almost all sedimentary strata are a result of Noah's Flood. They therefore claim that any sequence merely shows burial order, and correlation from one place to another is mostly wishful thinking based on evolution. Therefore, they reason the geologic column is largely fictitious. They say that it is a product of circular reasoning, the strata being dated on the basis of the fossils they contain and the fossils by the strata they are in. All of this after putting the fossils into an order assumed by evolution. To support their contention about the dating process, they quote from an old edition of the Encyclopedia Britannica, in which the author describes it as "arguing in a circle" ("Geology," Encyclopedia Britannica, Vol. 10, 1956, p. 168). But they fail to quote the statements following, which say that this is only an apparent paradox; that the order of the fossils is a matter of observation, and that fossils alone are used only where physical means cannot be used.

MR. HERRMANN: I would like to question more pointedly with regard to the succession of life forms. It is true that we do have a general succession of forms as we go from Paleozoic to Mesozoic to Cenozoic. This has been variously interpreted as being merely burial order, or as successive creations, or more popularly as an evolutionary sequence. Would you care to comment on the fossils found in this particular local geologic column that we find in the Arizona-Utah area? What is found step by step on the way up and what does it really prove? Does it show that an actual succession of life forms inhabited the earth? Or does it merely show burial

order with assemblages of plants and animals brought in from various geographic locations on earth?

MR. MACDONALD: If we were to start at the bottom of the Grand Canyon and work our way up, we would ascend through about one mile of Paleozoic formations. First of all, we would see fossil algae in the upper Precambrian. In the Cambrian formations, trilobites and brachiopods are the first animal remains that are found. The first vertebrates appear in the Devonian Temple Butte Limestone in the form of fossil fish. The 550-foot thick Redwall Limestone of Mississippian age contains the shells of marine animals such as brachiopods, mollusks and sea lillies.

The rest of the formations to the rim of the Canyon are all classified as Permian, the period closing the Paleozoic era. In the Supai Formation we find the fossil remains of the first land plants and animals. Similar fossils are preserved in the next formation, the Hermit Shale, which includes ferns and cone-bearing plants, insect wings and the tracks of salamander-like animals. The Coconino Sandstone, which we discussed earlier, has within its layers of consolidated windblown sand the tracks of reptiles and amphibians. The Kaibab Limestone which rims the top of the Canyon has more marine fossils including brachiopods, coral, sea lillies, sponges and shark teeth.

Now as we travel northward into Utah, we pass through series of Mesozoic and Cenozoic formations totalling more than a mile in thickness. Each of these overlies the preceding formation. There is no doubt about the sequence.

The first of these we encounter is the Triassic Moenkopi Formation, which contains the trails of land animals in some places

and sea shells in others. The Shinarump and Chinle Formations, also Triassic, contain the petrified wood of conifers. The petrified wood of the famous petrified forests of northern Arizona was preserved in the Chinle Formation. In this locality there are tree trunks standing in the place they grew. Also found in these formations are dinosaur bones, ferns and mollusks. The Jurassic Wingate and Kayenta Formations contain dinosaur tracks. Skipping on up to the various Cretaceous formations, we find the beds of coal and mollusks.

The colorful pinnacles in Bryce Canyon are made up of the Wasatch Formations, the only representative of the Cenozoic Era in this sequence. It is limestone and contains the shells of fresh-water mollusks.

That should give you an idea of the sequence of the record of life that is found in this one area. This is just a portion of the entire sequence of life forms found in the composite geologic column, but, as I said before, though the entire sequence is not found in any local sequence, the fossils that are present are always in the same order, and no other.

Can we account for this worldwide sequence by a universal flood? If during a flood one group of organisms were brought in from one area and deposited, then another assemblage from another area were deposited on top of that, and so on, we would have a local sequence. But the chances would be against the deposition of fossils in the same order in a local sequence in another area. What would be the chance that the same order would occur in all sequences worldwide? It would be nil!

It would therefore be impossible to explain faunal

succession. A flood would mix up sediments and fossils in a more random way than is actually found. A catastrophe tends to result in disorder, not order. But instead, we find, for instance, the perfect separation of trilobites and dinosaurs. There is never any mixing of their remains as one might expect if they both died in the same cataclysm.

The only explanation is that each geological horizon does indeed represent a definite time in the past during which the same assemblage of fossils was being deposited in many parts of the world. Slow deposition is therefore necessary to give time for the worldwide faunal changes from one stratum to another.

There are many other indications of long periods of time at all levels within the geologic column. Perhaps we can discuss a few of these later.

I'm not saying there have been no worldwide floods; there have, but the deposits they have made are relatively minor in comparison to the total thickness of sedimentary rocks. Dr. Hoeh has made the comment that Noah's Flood is discernable only by archaeology, not geology.

What, then, does all this show? Certainly not that life has evolved from inorganic materials to the complex forms we find today.

Animal life appeared suddenly in the Cambrian, and we find a wide variety of life which includes all but one of the animal phyla. Cambrian life included trilobites, which are included in the Phylum Arthropoda, a group of animals second only in complexity to vertebrates. Likewise, at other levels of the fossil record, we find the sudden appearance of new life forms without any predecessors

from which they could have evolved.

Faunal succession does not indicate evolution, but it does show that life forms have varied from one time to another throughout geologic history. The only explanation for faunal succession is that at various times throughout geologic history, new organisms were created, and at other times, species were destroyed or allowed to die out.

MR. HERRMANN: I would like to ask for a comment on this item of time intervals. In order to demonstrate that we are dealing with a considerable period of time--in terms of thousands of years rather than the few months of the Flood or some earlier similar catastrophe--we must find evidence that these time intervals are real and not hypothetical. How do we know that the entire Paleozoic and on up through the major part of the Mesozoic was not put down formation upon formation in quick succession. Is there convincing proof of some definite time intervals?

MR BURKY: The most obvious indication of deposition over a period of time is the occurrence of trees which have been fossilized standing in the exact location and position of original growth. A tree obviously requires a number of years to grow. The strata on which the tree is growing was obviously deposited prior to the strata in which the tree is buried by at least the number of years equivalent to the age of the tree. We have reference to a number of standing trees such as this in Paleozoic and Mesozoic strata, which we previously thought had been deposited in rapid succession.

Nine other points of evidence for depositional time follow. While these may not be immediately obvious to an untrained observer, they are valid proofs.

1. Weathered rock and fossil soil formed on one formation before deposition of an overlying formation.
2. Sequences of mud cracks (sometimes with salt crystal impressions) within strata.
3. Algal "reefs" which have grown in situ in the middle of thick sedimentary sequences.
4. Fragments of lower formation (often with fossils) included within upper formations.
5. Metamorphic rocks immediately overlaid by unaltered sedimentary rocks.
6. Erosional surfaces formed on a lower formation before deposition of the overlying formation.
7. Evaporite deposits (minerals that are concentrated only by leaching and evaporation involving large quantities of water over a long period of time).
8. Precipitate deposits. (Deposits such as limestone that require chemical action working over a period of time on the residual products of the weathering of rocks to produce. Hematite (iron oxide) deposits are another example.)
9. Resistate deposits. (Certain minerals, which are highly resistant to weathering and decay, are widely dispersed in crystalline igneous rocks in the form of minute crystals. These crystals are released naturally only by the weathering away of less-resistant minerals. Granite takes a long time to weather! Concentrations of these minerals in conjunction with the source rocks is another time indicator.)

Using these time indicators and the fact that the Pre-cambrian, Paleozoic, Mesozoic and Cenozoic strata of the Grand

Canyon and southern Utah region can be easily verified to be in superposition, we can show that the strata were deposited over a considerable period of time rather than in one or two short periods of deposition. The length and complexity of such an undertaking rules out giving it at this time.

MR. HERRMANN: Let me bring up a puzzling example at this point. Just above the rim of the Grand Canyon we have the Moenkopi formation, and above it a hard, resistant conglomerate named the Shinarump. These two formations are easily traced out by eye over an area of more than 400,000 square miles across Utah and northern Arizona. The Shinarump is a conglomerate with pebbles up to the size of a hen's egg requiring a fairly swift current of water, and yet spread out flat over a tremendous area. How was this accomplished? What was the mechanism? Certainly no uniformitarian textbook has presented a solution. Geologists describe the formation, puzzle about the conditions that could lead to such a situation and then go on to the next problem. The Shinarump was put down before man was on the earth, so it obviously is not from any Flood of Noah.

MR. BURKY: There are a number of such strata in the geologic record that show similar characteristics of rapid deposition under abnormal conditions. These strata are the ones that should be properly explored for the positive proof of catastrophe. This can only be properly done by having trained men researching these specific areas and coupling that research with on-the-spot field work.

I would like to make one point clear. We are not advocating that all strata were deposited over long eons of time! Rather,

we are trying to point out that some strata required a long period of time for deposition, while other strata were obviously laid down rapidly. We would like to stress that a certain amount of field work must be done to determine which is the case. In times past, it has been all too easy to arbitrarily assign all strata to one or two "floods" and by so doing come up with something less than the truth of the matter!

MR. HERRMANN: Thank you, Messrs. Burky and Macdonald. Now, I'll ask Dr. Hoeh to sum up the relationships that he sees between the deposits of the Pre-Adamic world and the world man has seen. How does one tie the various fossil deposits into history and into the account in the Scriptures? And then any further comments that he might want to make. Dr. Hoeh.

DR. HOEH:

PROBLEMS IN MEASURING THE AGE AND EXTENT OF THE UNIVERSE
MR. HEGVOLD

Let me summarize the approach used in the astronomy class regarding the size and age of the universe. We begin with the most reliable astronomical measurements that can be made --parallax angle measurements. I explain those first of all. We utilize actual trigonometric data so that the students get the feel of the actual problems. I also point out the probability of error so that they get the feel of how much error is involved in these measurements.

On this basis, we build up the pyramid of all the measurements that go into the statistical parallax determinations. The dynamics of measurement of the earth as well as the sun and the galaxy we are supposedly in are shown as well.

Now we examine the relationship between these and the fantastic densities found for some of the stellar bodies. Some of these densities have been found to be as high as ten billion tons per cubic inch! On the other hand, the large red giants have densities that are so tenuous, one could go through a tube of a television set and meet more particles than in the nebulous red giants, according to their findings. I stress the fact that these fantastic density variations are demanded by the results obtained from these distance measurements and the syntheses based upon them. Then I point out at the same time that there is found to be very little variation in the masses of these stellar bodies. The overall masses of the stellar bodies vary only by a factor of

about ten to fifty times, as compared to these fantastic density variations--why? Could there be some misinterpretation or misuse of the data?

To illustrate the synthesis of an entire theory from the most meagre information, I use the measurements of Dr. Van de Kamp regarding his determinations of the satellites around Barnard's Star. The textbook, Exploration of the Universe, gives a blown-up picture of Barnard's Star today and where it was 22 years ago. Dr. Van de Kamp took measurements of the wobble in this star over that period of time--22 years. From this he determined that there was, first of all, one satellite around Barnard's Star. The orbit for just one satellite had to have such a weird path that he worked it out again for two satellites. He's a very competent mathematician as well as astronomer. But, like most cosmologists, he pushed his mathematical synthesis way beyond the factual data available.

Of course, you must remember that he set out to find another solar system--ours could just not be unique! He picked Barnard's Star because it had the highest proper motion of any known star. A thorough article about this investigation appeared just recently in the April 1971 issue of the Natural History Magazine authored by Dr. Van de Kamp. The article is very enlightening in that it illustrates the fantastic theoretical synthesis required from the factual information actually available. The diagrams and their captions are particularly enlightening. One picture, showing the wobble, is exaggerated 2,000 times! It's still just a little wobble even after being exaggerated 2,000 times! That is not very much, except in exaggeration! Over the period of 22 years Barnard's Star has moved--on the

rather large size photograph--about an eighth of an inch. From that little motion Dr. Van de Kamp determined that there had to be a satellite orbiting Barnard's Star. Finally he decided that there must be two bodies circling it. All that information from that little deviation over a period of 22 years! Was it from the data or sheer theory?

Theoretical syntheses of this nature are pointed out as we meet up with them. The students do actual calculations based on these theories so that they will, at least, be familiar with them. For example, we go back to Henrietta Leavitt's first work with Cepheid variable stars in the Magellanic Clouds, two galaxies in the souther sky. Variable stars are important "keys" to modern methods of interstellar (and especially intergalactic) distance determinations based on relative and absolute magnitudes. Henrietta Leavitt was the first to develop this relationship even though Harlow Shapley is more often associated with it. First of all, the distance out to the galaxy has to be known. Once this distance is assumed accurate, the rest of the theory is very logical--so we follow the logical development of the theory for Cepheid Variables. She plotted the variable stars found in one of the Magellanic Clouds on a graph and found that their periods were proportional to their magnitudes. She reasoned that since these variable stars have a very narrow divergence in breadth, they should have a very narrow divergence in depth as well. So, basically, she could take the distance R out to all of the stars of the galaxy as a constant. Then she reasoned that the variations in periods would be a function only of their magnitudes. From that she could make a graph of magnitude vs. period. Since the distance R was

assumed to be known and to be constant for all of the stars of the galaxy, the absolute magnitude could be determined for each variable star. This was the desired relationship--a relationship between the absolute magnitude of a variable star and its period, independent of the distance R. From this relationship, distances to unknown galaxies can be determined. This is the reason for the interest in variable stars today.

Notice that it all hinges on the initial value of R to the galaxy, and that in turn hinges on many other assumptions. That is the reason I go through the statistical parallax method and all of the other methods of stellar measurements as well. The students often get greatly confused, of course, and, in a sense, I mean for them to. I can't make it all so clear that they can follow everything clearly because the scientists themselves do not have a clear picture of it either. After the theory for this method has been developed, we go through some of the mathematical determinations based on the magnitudes listed in tables. So the student understands how these measurements are made and calculated--they also get a sense of their reliability as well.

Another assumed fact made by astronomers that is certainly not true was brought out by Dr. G. de Vaucouleurs in the magazine Science of February 27, 1970. This is another example of a well-known astronomer who does not agree with all these modern space measurements. He states that these determinations are based on symmetry. There is actually a whole science now, built on the principle of symmetry--it's called the science of form. Everywhere in space all things must be symmetrical which requires a uniform

density of matter throughout all space. This is the big point on which he disagreed. There is no indication that such uniformity exists in space. Yet this is a basic assumption of all cosmologists. This assumption is contained in the "cosmological principle," which states that there can be no edge to the universe because there must be complete uniformity throughout all space and that precludes any edge. Because if there were an edge, then obviously what is on one side of the edge would be different from what is on the other side of the edge. That would violate the principle of uniformity and uniformity must be maintained! Consequently a geometry had to be devised that would do away with the unwanted edge--relativity did this. Of course, it really is impossible to put a given quantity of matter into a box that doesn't have any sides, or any top, or any bottom--PREPOSTEROUS! Yet this is the consequence of uniformity as stated in the "cosmological principle!"

The idea of a static universe was abandoned because of what has become known as "Olber's Paradox." So we go through Olber's Paradox in class rather thoroughly and show why these assumptions had to be made in order to maintain an evolutionary concept of the universe. Why the "red shift," for example? Why the expanding universe?--which was a natural outgrowth of Olber's Paradox. Olber's Paradox was worked out for a static universe. He proved mathematically that the light at night should be just as brilliant as at mid-day. The mathematics is simple enough --something had to be wrong with the basic concepts for the universe.

This led to the highly theoretical "red shift" method for the determination of interstellar distances. The "red

shift" in the spectrum of a star (or galaxy) is supposed to be a result of the star (or galaxy) receding from the observer at a very high velocity, which causes a Doppler shift in the spectrum toward the red. Other possible causes of this shift are pointed out in class--one is that light being emitted from a very dense star would have its spectrum shifted towards the red because of its own gravitational attraction.

Hubble developed a method based on the "red shift" for measuring very large interstellar distances. He claimed that the velocity of recession was equal to a constant times the distance to the star (or galaxy). The constant of proportionality was called "Hubble's Constant." Its value was taken as 560 in 1931--now it is taken as somewhere between 50 and 150. Some constant! The velocity is found from the "red shift" and from that, the distance can be found by using Hubble's Constant. All of this does not prove that these distances cannot be measured, but it does show that there are many, many very doubtful assumptions made upon which these measurements are based. Maybe the distance to Alpha Centauri is accurate--but I'd doubt even that.

Mr. Herrmann always wants to pin me down as to how accurate I think these measurements are: "Do you think they are within 10%, 5%, 1%?" I just say that I don't know. I have no idea about it. All are ultimately based on the assumption that light travels at a constant velocity in a straight line through space and that it is not attenuated in any way. Yet there is good evidence that there are dust and gases in space that would cause attenuation of the light as it travels through it. Even parts of our own galaxy, for example, are blocked out by dense gases in

space so that stellar objects cannot be seen through it. The Horsehead Nebula is another example of dense gases in space blocking the passage of light. There are many indications that light as it is propagated through space would be bent, slowed down or attenuated in some way. There is no doubt about its velocity being constant in our own solar system--Roemer's experiment proved that. We go through Roemer's experiment in class.

The "cosmological constant" is another very interesting concept that we cover in class. In nuclear physics the problem comes up to account for attractive forces which hold the nucleus together. Protons normally repulse each other--what holds them together when they are as close together as they must be in the nucleus? Another force of attraction that is proportional to the inverse fourth power of the distance between them is theorized. This solves the problem mathematically and experimentally so far. The same problem in reverse is encountered on the cosmological scale. Gravity, the only force known to exist between stellar bodies, is a force of attraction. What, then, is causing these stellar bodies to be moving apart at such high velocities? What is causing them to be repulsed when the gravitational forces try to pull them together? How did they ever start going out in the first place? That had to be explained! Hence, the "cosmological constant." The "cosmological constant" is the coefficient for a repulsive term which is proportional to the inverse first power of the distance, R . At large distances, then, the force is one of repulsion rather than of attraction. This would account for the present state, but still would not solve the problem for a very closely packed initial state. It's interesting to note

that an infinite number of values are possible for the "cosmological constant." The simplest one to take to solve the problem is zero, and that is the one that is used. That also makes the entire repulsive term zero! So it is not used at all! It is just a gimmick that is used to try to explain, in a scientific manner, how matter began to move apart. There isn't any scientific explanation! But that the universe is dynamic--there is no doubt!

I stress the physical laws that are at work to help the student understand how absurd some of the theories that are postulated in astronomy actually are. For example, the theories that were advanced a few weeks ago in Science magazine to explain the retrograde motion of Venus. I wrote a short article on that subject for TOMORROW'S WORLD. The author presents several theories--tidal action and all that--but admitted that none of them would account for the planet slowing down. All take for granted, of course, that all of the planets must initially have been revolving in one direction. This author finally postulated that the planet Venus must have captured a moon to explain why it reversed its motion. Now every student of astronomy should understand that that would be an utter impossibility! It is not possible scientifically, that is. To quote from Abell's book, Exploration of the Universe, page 82: "It is important to note that if two objects approach each other from a great distance in space, they can never 'capture' each other again, moving in orbits that are hyperbolas." Yet "scientists" postulate things like that and they are published in reputable magazines and books. I don't know why they would contradict their own textbooks, but they do. The mathematics is not all that difficult.

Now concerning measuring the size and expanse of the

universe. To quote from Fred Hoyle's book, Frontiers of Astronomy, page 270: "The Universe is everything; both living and inanimate things; both atoms and galaxies; and if the spiritaul exists as well as the material, of spiritual things also; and if there is a Heaven and a Hell, Heaven and Hell too; for by its very nature the Universe is the totality of all things." With this definition such terms as "physical universe" or "visible universe" seem meaningless to me. How can you measure infinity? HOW can such a universe be limited? This is the connotation of Hebrews 1:2-3, that the universe includes everything. How can one measure the size of such a thing or tell how old it is? I don't think it can be done. And why should we really want to know in the first place? I don't think it is of vital importance for us to know how old or how large the universe is. Just to know that it is fantastic, that it is very large, that it is beautifully made should be enough. To be able to point out to the student and show him through a telescope some of the fantastic order and beauty that is out there is very impressive!

Basically, for our observation periods, we examine the planets because we can get better definition. For example, we can observe the satellites around Jupiter, the rings of Saturn and the phases of Venus. From these observations, the geometry and the motion of the bodies making up our own solar system can be studied firsthand. These periods seem to be exciting for the students. Right now, work on our own solar system is taking up much of the time of astronomers and scientists as they are beginning to re-evaluate much of the data about it.

An article appeared in the paper just the other day about the planet Jupiter not being a planet but in reality a sun. By their definition of a sun, it could be. This is a very important aspect of science--to define terms exactly. To know exactly what is in question is very important and that requires specific definition of terms. For example: What is a sun? Do you know? All of the stars are claimed to be suns, but that is just a matter of definition. Any self-radiant body is said to be a sun. Now if Jupiter is actually radiating more energy than it is absorbing, it is a sun by that definition. Some ask me--Mrs. Hill just asked me the other day, "Is Jupiter a sun or isn't it?" I told her that if it really was radiating more than it was absorbing, that it was indeed a sun--by that definition. Whether that means anything or not--it wasn't a very satisfactory answer for her--it doesn't mean much of anything to me either. It does illustrate the importance of knowing the definition of terms.

ADDITION TO MR. HEGVOLD'S PAPER
DR. ERLANDER

With regard to the evolutionary concept of how the moon originated, I would like to point out that today most scientists do not believe in the capture theory of the moon as presented by Mr. Hegvold. However, some contend that both the moon and the earth were in orbit around the sun. Then by a change in physical circumstances, the moon was captured from the sun's into the earth's orbit. However, as I pointed out in an article submitted to Dr. Kuhn about last November, 1970, this concept has also been proven wrong by scientists of this world.

THE EFFECTS OF ARTIFICIAL SELECTION
MR. HERRMANN

First, I will make sure that I am closer to the exit than you are, and then I will hold up one of my favorite books. One that I recommended our students buy, that they teach to their children, that instead of looking for the chaff in this book, they look for the wheat. It is entitled Evolution, written by Ruth Moore and the editors of Life, and part of the Life Nature Library. It is a tremendous book.

Too often we concern ourselves with the problem of teaching against evolution and fail to differentiate between the differing kinds of evolution. First, there is the evolution of something from nothing. Then there is the evolution of living matter from dead matter. Thirdly, there is the evolution of the great variety of forms of life that we see today from a common ancestor. All three forms are obviously wrong.

There is a fourth kind of evolution, more properly termed variation, and it is the "evolution" of varieties and even "species" from ancestors created only a few thousand years ago. A great portion of this book entitled Evolution deals with the variation of life forms after they have arrived on the scene. It deals with the evolution of breeds, of nations, of varieties and of individuals. This evolution, more properly termed variation, is true and is a fascinating subject to study.

How did the differing types of man come to be? How did

the races come into existence? the many nations? Sometimes we get so "carried away with the chaff" that we fail to understand or even be interested in the wheat that is left.

Mankind is an outstanding example. We know that man started with two individuals. Today there are billions of individuals, each differing one from another. How did this come to be? Let's look at specific events.

How was the line of Israel produced? Within them how was the line of David, a line of kings, produced?

Our story will start in the nation of Syria with a man named Abram. Abram is not a Jew, he is Aramean. His wife is so similar to him in features that people believe him when he states that she is his sister. Abraham has a son, Ishmael, but from an Egyptian woman named Hagar. This is not the proper son to produce the line of Israel; the genetic material is wrong.

A son is born to Sarah and named Isaac. A wife is added named Rebekah, and she too is so similar to her husband that he is able to claim her as a sister. The selection of a wife adds genetic material; the elimination of sons subtracts genetic material. A nation is to be produced having certain physical and mental attributes. Close marriages between relatives (inbreeding) would cause hidden variations to show up where they might either be selected or eliminated.

The selection of Rebekah gave the nation of Israel a forebear who was hospitable to strangers. She was willing to give freely of her time and energy, not only to do what was asked, but even more. Here is the origin of lend-lease and our give-away programs. Someone might ask, "Isn't this tradition of helping other nations

something that has been taught to us in our schools and churches?" Yes, to an extent, but isn't it also true that the capacity and desire to teach are inherited? From whom? Isn't there a scripture, "For I know him, that he will command his children and his household after him . . . that the Eternal may bring upon Abraham that which He hath spoken of him."? And Abraham's children today teach their children.

Few women are mentioned in the Bible, and when they are mentioned, it is for a good reason. In many cases, genetic traits are being added to the line of Israel or to the line of David. Two sons were born to Rebekah, Esau and Jacob. Esau was rejected prior to his birth. We might say for genetic reasons. This selection took place before anyone could begin teaching Jacob. Now consider the addition of a wife for Jacob. Suppose he had never married Leah. She have him sons who play leading roles in today's world: Reuben, Simeon, Levi, Judah, Issachar and Zebulun. Rachel gave him only two sons: Joseph and Benjamin. Then there are the children of the two handmaids. They form nations today, but not of the prominence of Leah's children. Dan, Naphtali, Gad, Asher, these four form interesting additions to the world's population, but not at all of the prominence of Leah's children. The children of the handmaids differ genetically and, while they share in the blessings given to Jacob, yet they do not have the same potential to serve as the other group.

Now, within the matrix of Israel, let us consider the production of a line of kings. The firstborn, Reuben, is termed "unstable," which leads to bad judgement, which leads to losing the

right to be the progenitor of a line of kings. Reuben's action has often been mentioned, but the genetic feature has been overlooked. Simeon and Levi are violent men. Could they have produced a line of kings? Was it only their action that was wrong, or were they genetically unfit to be the progenitors of David's line?

Next in line is Judah. But Judah picked the wrong kind of wife, a Canaanite woman. She bears him three sons. And for that firstborn son, Judah chooses the kind of woman--Tamar--that had every right to be the queen mother for the line of David. The word Tamar means palm tree, and apparently describes a woman of queenly stature. She values that position highly, not being a profane person as Esau was, but looking forward to many generations of kings who would call her their queen mother.

Judah's first son dies, his second son brings the death penalty upon himself, and Judah, in his heart, withholds a third son from Tamar. By virtue of that decision--this isn't kosher I know--but the genetic end is being carried out--Judah has thus placed himself next in line to provide Tamar a son. We then have the situation occurring where Judah demonstrated that gift of gab that comes natural to him.

What do we mean when we say that the "gift of gab" was natural with Judah? Don't we mean that he was born with it? That he could pass it on to his descendants? He was the salesman of his brother Joseph, the spokesman in dealing with his unrecognized brother, the spokesman in dealing with his father Jacob; but after the incident with Tamar he authors what certainly must be the world's greatest bit of understatement, not that Tamar had

made an error and he Judah a greater error, but that "she hath been more righteous than I."

Are the Gentiles important? If not, then why were two of the sons of Noah allowed to bring Gentile wives safely through the Flood, and in so doing bring non-Semitic characteristics with them? And in the line of David we find Rahab, a Gentile woman. Little by little the traits of a king are being assembled. Here is a woman who would "give aid and comfort" to spies who had come to seek out the strength of the evil city in which she dwelt, where the practice of infant sacrifice was common. A woman who puts principle ahead of political affiliation. Further along in history we find Ruth from Moab. Israel was not to marry into this tribe. How did Ruth happen to become a progenitor of kings? Who is doing the selecting? This is an item I want to emphasize here.

We have God playing the role of a Luther Burbank, watching over the production of the nation of Israel and the line of David. And the principles that He used in selecting, in adding, in subtracting, are principles that a skilled cattle breeder might do well to study. There is variation in the human race, and that variation, coupled with proper artificial selection, has produced some fascinating results in the nations of the world.

In the selection of dairy cattle, one thing and one thing only is considered, milk production. The dairy sire is chosen by carefully studying the milk production records of his "mother" and "grandmother," not by any of his particular qualities. In Texas, a different principle is being followed. There, young bulls are allowed to grow up and then are selected for their own characteristics. In this way, one is able to tell whether a bull is going to be tame

or to tend toward violence. The dairy bulls I grew up with were not safe to turn one's back on. Milk production is the only important thing. To find that in Texas that they were searching out a tame bull was a noteworthy item.

Returning to our problem of the building of the nation of Israel, contrast the Arabs of today with Israel, or consider the people of Turkey. A portion of their problems can be corrected by proper education but, at the same time, one must acknowledge the role of genetic difference. Both Ishmael and Esau were different from Isaac and Jacob. And if Ishmael and Esau both picked wives similar to themselves, obviously they produced markedly different nations.

Consider again the principle, that if a man dies without having a son, his brother should father a son for him. Consider how this practice affects the heredity of one's children. Each of us in selecting a wife is able to select fifty percent of the heredity of his children. Our own fifty percent was handed to us at birth. We had nothing to do with it. I find that by heredity I am missing one tooth on the lower left. Three of my children are also missing that same tooth. That is part of their inheritance.

Now if a man dies without a child, his brother. . . now this brother has practically the identical genetic traits that he had. Not completely, but for the most part, the brother could produce the same kind of children. If you wanted sons with certain characteristics, certain talents--musical or math or whatever they might be--but if you die, your brother could provide the same children with the same heredity that you had intended. The only portion of your children's heredity that you could select, that fifty percent you have already selected in choosing a wife.

Returning once more to this Life Nature Library book entitled Evolution--buy yourself a copy--search for the wheat--forget the chaff, teach your children the principles of variation and selection that are contained here. What an Everliving Luther Burbank was able to do with the human race to produce nations and individuals can also be done by man in the flower garden and in his domestic animals.

Now in addition to variation within the kind, we also have the item of degeneration. That missing tooth is certainly degeneration. The fact that a person might be an albino is degeneration . . . these factors do show up in today's world and God did not purposely intend them. But He did intend variation.

His hand is evident in a dozen places in the production of the nation of Israel. What if Jacob had had his own way and had not taken Leah as his wife? True, Laban was scheming, but God turned it for good. Joseph's brothers were scheming also in selling him into slavery, but God watched over it and meant it for good. Behind these "Bible stories" we see a Guiding Hand carefully putting together the genetic material of a nation to carry out His prophecies and to bring the world to its present state.

Would the world have been better off without the French people, without Simeon and Levi (the teachers and the priests), without the Jewish people? Some misguided Germans and Russians think so.

Would the human race have separated into nations without God's intervention at the tower of Babel? Nations were to be formed and preserved. Intermarriage would have destroyed these nations. We find that nations were first isolated by a language barrier,

then geographically separated on earth. Each segment of the human population is important.

Thus generation after generation, we see that God had His hand in the development or "evolution" of the nations. The study of the principles used would be fundamental to any individual dealing in animal or plant husbandry, whether he be raising chickens or cattle, or whether a fruit orchard or a flower garden.