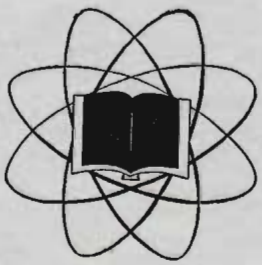
JOURNAL

of the

AMERICAN SCIENTIFIC AFFILIATION



The fear of the Lord is the beginning of wisdom. Psalm 111:10

Volume 7 **September, 1955** **No. 3**

The American Scientific Affiliation

(INCORPORATED)

The American Scientific Affiliation was organized in 1941 by a group of Christian men of science. The purpose of the organization is to study those topics germane to the conviction that the frameworks of scientific knowledge and a conservative Christian faith are compatible.

PUBLICATIONS

The Journal of the American Scientific Affiliation is issued quarterly. Its contents include primarily subjects both directly or indirectly related to the purpose of the organization, news of current trends in science (including sociology and anthropology), and book reviews.

Modern Science and Christian Faith, is a 316-page book containing ten chapters on nine fields of science, each written by a person or persons versed in that field.

A series of *Monographs* as follows:

No. 1. *Christian Theism and the Empirical Sciences,* by Cornelius Jaarsma, Ph.D. A 10-page booklet. "The data of the sciences are given their true structure when integrated in the unity of Christian thought based on revelational presuppositions."

No. 2. *Creation and Evolution,* by Russell L. Mixter, Ph.D. A 31-page booklet covering various aspects of the subject, and showing that limited creation is a reasonable belief.

No. 3. *The Eye As An Optical Instrument,* by Frank Allen, Ph.D. A 16-page illustrated booklet discussing the intricate marvels of the eye.

Other Monographs are planned for publication in the near future.

EXECUTIVE COUNCIL

The Journal Of The American Scientific Affiliation

Vol. 7 SEPTEMBER, 1955 No. 3

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The Journal of the American Scientific Affiliation is published quarterly, March, June, September, and December by the American Scientific Affiliation. The publication office is located at 435 Robinson Street, West Lafayette, Indiana. The subscription price is $2.00 per year. Single copies may be obtained at a price of .50 each. Copies of back issues may be obtained at the price of $2.00 per volume. Send all communications regarding editorial matters to the editor, Delbert N. Eggenberger, 1121 East 81st St., Chicago 19, Ill. Entered as second class matter January 23, 1952, at the post office at Goshen, Indiana, under act of March 3, 1879, as amended by the acts of June 11, 1934, and October 30, 1951.

EDITORIALS

In the content of this issue of the Journal we have deviated from the regular fare. Instead are included the entire set of papers presented at the joint meeting of the American Scientific Affiliation and the Evangelical Theological Society held at Grace Theological Seminary, Winona Lake, Indiana, on June 21-24, 1955.

This meeting was conceived for the purpose of becoming acquainted with each other, discussing our mutual problems, and planning ways of integrating the contributions that each group can provide. That the meeting was successful is evidenced by the enthusiasm engendered toward continuing such joint gatherings.

The papers are presented *in toto* without benefit of refereeing or other critical examination. This was done in the interest of expediting their publication in as short a time as possible. The views presented in papers and comments are to be considered those of the individual, and which may or may not be shared by others in either group. Since both groups are interested in free and open discussion in order to arrive at conclusions, there is, of course, great diversity in viewpoints on many matters.

The discussions on each paper have undergone major surgery and, in general, only significant contributions have been included.

New Members

Roy M. Adams of Darlington, Penn., is an associate professor of Chemistry at Geneva College. He received his B.S. in Chemistry from Sterling College, and his Ph.D. in Chemistry from the University of Kansas.

Dr. Charles B. Beal who received his degree in general medicine from Harvard and who studied one session at the University of Paris is a medical missionary under the Conservative Baptist Foreign Mission Society, in French West Africa.

J. Hartwell Dunn, M.D., 1939 Northwest 35, Oklahoma City, Oklahoma, is self employed in the private practice of urology and also is an instructor in Urology at the University of Oklahoma School of Medicine.

Fred K. Elder, Jr., 709 South Grant Ave., Crawfordsville, Indiana, is an associate professor of Physics at Wabash College there. He received his B. S. in Physics from the University of North Carolina and his Ph.D. in Physics from Yale University.

Samuel A. Elder of 105 Lafayette Avenue, Annapolis, Maryland is an Assistant in Physics at Brown University, Providence, R. I., where he received his M.S. in Physics.

Cletus L. Hostetler, Elmira, New York, received his B.A. in Physics and Mathematics from Goshen College and has been doing graduate work at Ohio State University.

Harold H. Key, a graduate of the University of Texas, is associate director for the Mexico Branch of the Summer Institute of Linguistics. He recently returned from Mexico and is now residing in San Diego, California.

Gladys J. Kleinschmidt, M.D., who received her B.A. in Pre-med from Hope college and her M.D. from the University of Michigan, is now Director of the Mason-Manistee District Health Department.

Kenneth M. Long, of Culp, Arkansas is teaching science and mathematics at Bethel Springs School, Culp. He received his B. S. in Chemistry from Goshen College, Goshen, Indiana.

Robert A. Oetjen is an associate professor of physics at the Ohio State University. He received his Ph.D. in Physics from the University of Michigan, and an A.B. in education from Asbury College.

Preson P. Phillips, Jr., is president of the Graham Bible Institute, Bristol, Tennessee. He received his Bachelor's degree in Chemistry and his Master's degree in Organic Chemistry from Duke University.

Emory Pitzer, Bartlesville, Oklahoma, is a group leader in the research and development department of the Phillips Petroleum Company, Bartlesville. He received his A.B. in chemistry from Kansas State Teachers College.

Richard D. Reed, 428 W. College Avenue, State College, Penn., is doing graduate work at the Pennsylvania State University where he earned a B.S. degree in Petroleum Engineering.

John Reno, 280 Bridge Street, Cedarville, Ohio, is an instructor in Science at Cedarville Baptist College. He has also served as Chairman of the Council of Met. Regular Baptist Fellowship, member of the Council of Regular Baptists of the Empire State and pastor of the First Baptist Church, Patchogue, New York.

Robert R. Sanders, Altadena, California, is a communicable disease inspector for the Los Angeles County Health Department. He received his B.A. in Biology from Colorado College and his M.S. in Entomology from Washington State College.

Roland G. Scherer, M.D., is practicing in Bozeman, Montana. He received his M.D. from the University of Minnesota and then did graduate work in Urology at U. of Minnesota-Mayo Foundation Graduate school.

Herbert S. Wolfe, M.D., is practicing medicine at New Knoxville, Ohio. He attended Wheaton College and Kent State University, and received his M.S. from the University of Buffalo.

The A.S.A. History and Purposes*

H. Harold Hartzler, Goshen College, President of the A.S.A.

Christian friends, it is a great treat to meet in this joint meeting. Those of us who have been active in the affairs of the American Scientific Affiliation have looked forward with anticipation for more than a year to this meeting, and I am very happy to see you people here this afternoon as evidence of your interest in the work of these two organizations. I really think we are on pretty common ground. The Scripture which was read I thought was very appropriate for an opening—how that God's work and God's Word corroborate each other, how wonderfully they correspond. Even though in days gone by, some men have found fault, have disparaged the Word of God, have said the facts of science do not check with the Word of God, yet we as believing Christians thoroughly repudiate such pronouncements, for the more we study science and the more we study the Word, the more we can see beautiful confirmation one of the other.

This afternoon I am asked to speak of the history and purpose of the American Scientific Affiliation. Speaking to this mixed group, of course I must start from "scratch." In Chicago, in September of 1941, a meeting was called to consider this problem which college students have, of going to college as Christians and finding there teachers who do not believe the Bible and who, in many cases, undermine their Christian faith. This problem was particularly brought to the attention of some people by those people who had been connected with *Sermons from Science*. Probably you all know of Irwin Moon and his work. F. Alton Everest, now of our own organization, was asked by Irwin Moon in 1940 to investigate some means whereby this problem could be attacked. Mr. Everest at that time was Professor of Engineering at Oregon State and he did some investigating that year preparatory to forming such an organization. This was rather preliminary. Nothing was done until 1941 when a letter went out early in the year from the then president of Moody Bible Institute, Dr. Houghton, who suggested in that letter to a number of people who were interested in science, who were convinced Christians, that it might be possible for them to gather together in Chicago in September, to consider this matter. So five people met in Chicago. I would like to honor them by announcing their names and their connections. To me they are the fathers of this organization.

The first one I'd like to mention is Dr. Irving Cowperthwaite, then Instructor in Chemistry at Columbia University, now chief engineer of Thompson Wire Company, Boston, Massachusetts, a very devout Christian. Dr. Cowperthwaite has attended every national convention of the A.S.A., starting in 1946 at Wheaton College.

The next person I'd like to mention is John P. van Haitsma of Calvin College, Professor of Biological Science. Now before I joined the organization in 1944, Dr. van Haitzma was already to the advanced age where he did not attend the meetings, and so even though we met at Calvin College in 1948, I did not get to know him. Next is Dr. Russell Sturgis of Ursinus College, Collegeville, Pennsylvania, Professor of Chemistry. I've never seen this man either; he's always stayed clear of our national conventions though he has been an active member of the A.S.A. Next is Mr. Peter Stoner, formerly Professor of Astronomy and Mathematics in Pasadena City College and now at Westmont College in California. He's been an active member of our organization all these years. Finally, and probably most important to this whole organization, is F. Alton Everest, Associate Director of Moody Institute of Science, Los Angeles, California. I'm quite sure everyone in this audience has seen their films. Alton is the technical man who is back of the scenes and many times he gets on the scene and you see him there. These are the men who met for five days in the city of Chicago. Their expenses were totally paid by an unknown friend of M.B.I. They were told to go ahead with this problem—no strings attached—do as they felt they should do. So they considered this matter and came up with a number of ideas. One idea was that an organization should be formed, which was later named the American Scientific Affiliation. Since there were five of them, they organized with five charter members and they were the executive council. And so today, yet, we have five members of the executive council. I think perhaps it is time, since our membership is now over 650, that we increase the membership in the executive council. This matter has been under consideration by the executive council for some time, but as yet we still have five members. These five men essentially run the affairs of the Affiliation under the direction of what is now known as the *Fellows*. At the A.S.A. it was decided a number of years ago that perhaps it would be good to have two grades of membership, the Fellows and the Associates. The Fellows are those who have the running of the organization, that is, they can vote, hold office, and have all the rights and privileges of the organization. The Associates are disfranchised members, have no vote, and can't hold office. However, they can participate in the convention, read papers, participate as anyone else, receive all the literature except some confidential literature which we sometimes pass out to some of the Fellows. I assure you this confidential literature is not very extensive. For instance, we sometimes review books very critically and feel that perhaps it shouldn't go any farther than the Fellows. So that's been the decision. By the way, it should be pointed out that we do criticise each other very frankly and freely and I would hope that in a meeting like this we could have free, open discussion. That has been the history of the A.S.A., and one doesn't feel hurt because what you say has been challenged by the next speaker; you

* Transcribed from a recording made of the address.

have a right to come back at him at any time and that's what makes for an interesting meeting.

The organization did not grow very rapidly, since Pearl Harbor came along with restrictions and no meetings for several years. Membership did not increase until 1943. By 1944 I recall I received information concerning this organization and I believe we had a membership of 44 at that time. After 1944, the work increased; the main job at that time was writing the book which we now know as *Modern Science and Christian Faith*. At first we thought of it as a handbook for students who were troubled. *Modern Science and Christian Faith* has served a useful purpose; it has gone through two editions. This book has sold quite a number of thousand copies and I think it will continue to serve a good purpose. Not until 1946 did we have our first convention. Now you can't do very much work in an organization of this kind unless you have a meeting once in a while. So from 1941 to 1946 the main project was development of material for the book *Modern Science and Christian Faith*. I well recall that first convention at Wheaton College. As I look over this audience I find only Dr. McRae who was present at that meeting.

Well, that was an eye-opener to me. I was just thrilled through and through to find men of science throughout the country who were interested in God's Word. Well here at Wheaton College I found men from all over the country who were vitally interested in this. I was especially struck with the fact that each meeting was opened with prayer. A science meeting opened with prayer! I had attended many science meetings but this was the first of this type that I had had the privilege of attending. I met many friends at that Wheaton meeting that I have cherished through the years. It's a great inspiration to go to these annual meetings. I have attended each of these meetings, as has Dr. Irving Cowperthwaite, Dr. Paul Bender and Dr. Philip Marquart. Beside our annual meetings, the A.S.A. has had some local meetings. The California group started this some years ago and it has been very active in holding three or four local meetings in the Los Angeles area, where they discuss problems pertinent to our work. New York City has had a group for several years. Taylor University and Marion College, combined several years ago but they have discontinued in recent years and in its place we've had the Illinois-Indiana section. We've had very fine fellowship through the years. We've grown to the stage now where we think we better divide and have an Illinois section and an Indiana section. Other sections are in prospect. Last spring during Easter vacation I had the privilege of making a trip in the interest of the work to the eastern part of the country where I met in Washington, Philadelphia, Harrisonburg, Virginia, Central New Jersey, New York City, Houghton College, New York in the interest of developing more local meetings. I think that out of that we shall have more local meetings. We feel that they are an important part of our work.

We have had a publication program for some years. In 1949 we started issuing a quarterly journal wherein we printed the principal papers presented at our conventions and other items of interest to our members. We now periodically publish book reviews, and also try to keep members in other fields informed as to what's going on in science. So we have short columns, on Astronomy, Archaeology, etc. To me, one of the side lights on an organization like this is the insight that it gives you into other groups of scientists. A man wrote to me recently from Texas, saying that the meeting of the A.S.A. is the only one in his experience where he gets to rub elbows with scientists in other fields and he feels that it's of very great value to him. I think so too.

Through the years we have grown numerically. In 1944 we had 44 members, by 1946 we had 70 members and by 1951 we had around 130 members. Now we have over 650 members. Our organization is continuing to grow. We are not interested in becoming especially large but some of us have felt through the years that if we wanted to have an impact on the scientific world, we need to have more than 100 or 150 members. We have attempted to become affiliated with A.A.A.S. but as yet that has not been consummated. Some of our members are not certain that we should. Perhaps it is not the Lord's will that we should become affiliated with the A.A.A.S. but some of us feel that there would be decided advantages for such affiliation.

Now as to our purpose. WHY THE AMERICAN SCIENTIFIC AFFILIATION? One good brother stated that our title was inadequate, American Scientific Affiliation, because we are primarily a group of Christian men of scientists. And I think that by and large we have put the term Christian primary. Sometimes we debate among ourselves, are we a science organization or a Christian organization? We always come back with the statement that we're both. I rather like F. Alton Everest's statement to me this last year on this very point. He says, "After all, we happen to be a bunch of Christians who are working in different areas of science."

Well, what are we interested in—in banding together in this work? Probably our aims are broader than was envisaged by the founders, because, as I said, the founders thought of one main point and that was of helping college students who found difficulty when they went to colleges and universities. Particularly, I think they were interested in universities, the larger schools where a young man or young woman is thrown out in the world, as it were, on his own and needs some help. The A.S.A. thought they might be of some help to such.

Today, I feel our purposes are somewhat larger than that. A number of things might be mentioned as to the real reason for the existence for the A.S.A. First, it is a good thing to get together as we are today to have

Christian fellowship. I assure you it is good for all of us, whether coming from a Christian school, a state university, from government agencies or from industrial concerns. It's sweet fellowship that we've had through the years. I think that is an aim or purpose though we do not usually think of that as a purpose. We are interested primarily, I think, in showing that men of science in this day and age can be good scientists in their own right and still be Bible-believing Christians. We would like to show the world that this is a reality, not just someone's theory, not an old fashioned idea that has been thrown away two or three hundred years ago but to show that in 1955 in the U.S.A. and in other countries of the world that there are scientists who are Christians. It has often been stated that many scientists immediately give you up when they learn that you are a Christian. "What can he amount to, he's a Christian, he's biased." We would like to set the record straight on this point and I think it is worth while for any man to do something in this area.

Today we're considering the big problem of a Christian philosophy of science. What is it? How does it affect our work? What are its implications? Our organization is in the throes just now of considering this great problem. We have been challenged by a number of our members to dig into this area of a Christian philosophy of science. Now more particularly we are interested in God's Word. In our opening session we had that wonderful Psalm 19 read before us, how God's Word and God's work check with each other. That is one of the the basic aims of the A.S.A., to show that there is no basic conflict. To be sure, conficts have arisen from time to time, men have been disturbed, their faith has wavered because of a certain scientific discovery. But, upon closer study, we find a beautiful harmony. The A.S.A. is interested in continuing this study.

I should state here and now that the A.S.A. does not have any official policy on any scientific matter. After all, scientific theories come and go. They are seasonal. What is good science today may not be good science tomorrow. But we continue to believe that the Word of God is firmly established forever. We must be on our guard because many false cults have arisen, claiming the authority of the Word of God and so it takes very careful study and we are very thankful for men of the Evangelical Theological Society to help us in the problems involving God's Word. We need language scholars, we need theologians to help us in these areas. I'm very, very happy that we can have this joint meeting this week at Winona. I think it will be a step forward in the work of the A.S.A.

Now I would like to add a further word and for this I would like to use Scripture. I would like to read just a few verses from Matthew 13:3-9. What I would like to say this afternoon is that the A.S.A. is the organization which is attempting in our day among the scientists of the world to loosen up this stony ground, to get rid of some of these thorns, these stones, to prepare the ground for the seed, the Word of God. I am challenged by this thought that the scientists of the world do not accept God's Word because of so many objections which they have conjured up themselves or heard from others. But actually they do not know the Word themselves many times. So we hope that we can, by our literature, by our personal testimony, meeting person to person, by our national meetings, in a small way, at least, attempt this great task of making this ground in hearts of men fallow ground so when the seed is sown, the Word of God may find root, spring up, and bring forth life. After all, the A.S.A. is interested in the souls of men. We don't say in our literature that we are an evangelistic organization. In fact, some of our members go so far as to say that we really aren't. But I think at heart everyone is. What Christian isn't, if he is a sincere Christian. Naturally he wants to see others won to the Lord Jesus Christ and fundamentally that is our aim. If you want to deal with a man who is an unbeliever or one who has lost his faith, who is a doubter, one has to do something in preparing him before he is ready to receive the Word. We are hoping that we can do something in this great field of preparing the soil of the hearts of men for the Word of God so that then the minister or the personal worker or whoever it may be, may then lead that person to the Lord Jesus Christ. I think it is a great day when the A.S.A. and the E.T.S. can get together in this great task, to do our small part, in the great task of evangelizing the world.

The E.T.S., History and Purpose*

Burton L. Goddard, Dean, Gordon Divinity School

I suppose that some of us come from the teen-age generation that was quite familiar with "The Prisoner's Song." There's a line in that song which goes this way: "It's a story that's never been told." The E.T.S. is not as fortunate as the American Scientific Affiliation in that the E.T.S. story has not been told or put into written form. Perhaps it will be written some day. This afternoon it is not my purpose to tell you that story but to give you just a few chapter headings which may give an idea of what would be in the story if it should sometime be told.

I. VISION

The first chapter heading is "Vision." The idea of having a society for Biblical and theological studies is not a new idea. There are organizations in existence and which have been in existence for some time, the members of which have come together that they might study along Biblical and theological lines. There are two difficulties, however, with organizations of this kind which have been known to some of us. One of the difficulties is that there is no common religious ground. When approaching religious and theological studies, it is not possible to approach them with one aim and purpose, with one set of presuppositions. We also notice

* Transcribed from a recording made of the address.

that in some of these organizations there is a tendency to engage in peripheral studies, i.e. areas of study which are related in some way to the things of the Bible but which are not vitally related to the truth of Scripture. There is all too little attempt to understand what God had revealed to man and how it might be applied.

How much better, it seemed to some, if there could be an organization which would have a common faith and which would approach problems with a common religious attitude—one of accepting the Bible as the Word of God, of coming in faith and with humility to study and to discuss what God has to say! How much better it would be if there could be an organization which would in particular stimulate and foster the development of theological studies along conservative or evangelical lines so that there might be an impact upon the world in which we live which would bring glory to our God! There was also the thought that we needed more of a body of evangelical theological literature. There are books that come from the press every day. Over a period of time, the number of these books is almost legion, and yet how few of them there are that approach the problems of theology and Bible interpretation from an attitude of faith. There being a dearth of up-to-date Conservative theological literature, it seemed in point to have an organization which would devote itself to the fostering of such literature.

We, like the folks in the A.S.A., have a desire for real Christian fellowship. In thinking about the possibilities of such an organization, I am sure that there was a desire on the part of many that there should be an avenue for those of like precious faith that they should get to know each other and to have the very precious fellowship of the saints. Also, there has been a very great deal in the way of differences in the theological world, within the *evangelical* theological world, if you will. We have our denominations. Some are of this denomination and some of that denomination. We don't get together very much. We tend to be divided rather than be together. Just a few days ago, now, some kind Roman Catholic sent to my desk a copy of a Catholic newspaper. Along with this newspaper was the Easter church section page of the Protestant churches of one of the suburbs of greater Boston. Written across the top of that page was something like this: "How can you read this and believe that all this is of God?" Well, there might be just a little bit of a barb there, and some of us have felt that we ought to do something about getting together, howbeit without compromise, rather than to be content with diversity and separation. We have folk in the Calvinistic camp and folk in the Arminian camp. They haven't had very much fellowship; their lines of activity have brought them together by groups, but haven't brought them together with one another. We also have folk of varying eschatological positions; they tend to congregate in different places. Apparently some bridges needed to be spanned. We have our councils, you know. Some are of this council and some of that council. In the minds of a great many people there has been a real desire to give some considerations to what the Scriptures have to say about a unity which is not based upon just any old common denominator but which is based upon unity of faith and which perhaps represents somewhat of an ecumenicalism that we haven't seen very much and and haven't heard about very much. Then there were thoughts that if there were such an organization, it might provide for some professional contacts so that men who are teaching in the various schools might get their heads together, might share some of their ideas. There are also young men who are preparing for the ministry—not just the ministry of the pastorate, but the ministry of teaching. When these young men get to the place where they are ready to go out and to identify themselves with some organization or institution professionally, they are somewhat at a loss as to how to proceed; they haven't had the proper contacts. Perhaps an organization which would bring these young students together with the administrators and teachers of various colleges and seminaries would be very, very helpful to the young men and also to the schools themselves.

Here was a vision, a vision which wasn't just the brain-child of one individual, nor of two, but which had been born in the minds and hearts of many men the country over. Not very much had been done about it, but it was there. The idea was there and ready to be exploited.

II. ACTION

Then came the time for Chapter Two; that was "Action." Action began, especially up New England-way. At Gordon Divinity School there were talks about the problem, the need, the vision—not only talks, but prayer that the Lord might be pleased to do something to the honor of His Name. Contact was made with some of the leading evangelical scholars of our country, men who were known to some of us of that institution. The question was raised with these men through personal correspondence: "Would you be interested in fostering such an organization? Would you be interestd in joining together and extending a call to other men that they might come together to do something about implementing the idea, making it not just a vision but an actuality?" The response to that correspondence was splendid, and a number of men pledged themselves to issue a call for an organizational meeting. The call was issued. But what was going to happen? Men were being asked to come together to a central place in the city of Cincinnati in December of 1949, just after Christmas, on the 27th and 28th of the month. These men were to come at their own expense. There was no organization to sponsor their coming. They were to travel great distances. They were to come without subsidy, and in most cases their salaries left much to be desired. There wasn't even any host, as in the case of the initial A.S.A. meeting—no Moody

Bible Institute or other institution or organization. There wasn't even a host pastor or a host professor in the city of Cincinnati. Yet the call was issued. The Y.M.C.A. in the city of Cincinnati graciously allowed us to meet in its central building. Its leaders cooperated in a very wonderful way—far beyond that which we could ask or think. It led some of us to be a little more confirmed in the matter of predestination, for everything worked together for good. When the roll was called, there were present somewhat more than fifty men of theological ability, representing the East, the West, the North and the South. We didn't have any Canadians, nor any folks from Turkey or China there, but the States were well represented. We had a very splendid group of men.

We met together for only a day and a half, a short time, indeed. Could anything significant be accomplished in so brief a period? Well, we adopted a provisional constitution, which hasn't had to be amended very much since that time. We heard three splendid major addresses, two keynote addresses and a banquet address. We heard nine excellent papers about Biblical subjects. We had fellowship together in worship. We had informal Christian fellowship. We made some decisions. One of the decisions was that instead of being just a society for Biblical studies, the exegesis of the Old and New Testaments, we should be an evangelical *theological* society and would welcome to our discussions and membership and fellowship those who were not just interested in the narrow interpretation of Scripture but in all the various things which one hears about in theological seminaries—all the aspects of the theological curriculum. We also did something which I think was very splendid and which has subsequently proved itself to be so worth while. We had to agree upon some kind of a religious basis. We might have adopted some long confessional statement. We could have decided upon a relatively short statement. But this is the one statement of fellowship for meeting together which the society adopted at that time: "The Bible alone, and the Bible in its entirety, is the Word of God written, and therefore inerrant in the autographs." We have found it to be an excellent basis for functioning together, because, while we may come to some varied conclusions, we have a common basis which honors the Scriptures as the inspired, inerrant Word of God.

At the close of the sessions, a Jewish scholar of some reputation, whose books you know and who had come to the meeting as an observer, spoke to me personally at one side of the room and said, "I venture to prophesy that within ten years the men who are beginning this organization will have taken the leadership in the matter of Biblical and theological studies in this country." This was rather an optimistic prophecy. It will probably take a lot more than ten years for anything of that kind to happen, but the word of this man will give you somewhat of an idea as to the success of the organizational meeting.

III. DEVELOPMENT

The third chapter is "Development." I do not know the exact number on the E.T.S. rolls at the present time, but would conjecture the number to be about 200 or more, most of whom are full-fledged members, a few of whom are what we call student associates. We don't even call those in the latter category "members." We've had splendid leaders during the years. In 1949, the man who was elected to be the first president of the E.T.S. was Dr. Clarence Bouma, an outstanding Christian theologian. In 1950, elected to the same office, was Dr. Merrill C. Tenney, head of the graduate school of Wheaton College. In 1951, Prof. Charles Woodbridge of Fuller Theological Seminary was chosen as President; in 1952, Prof. Frank Neuberg of Wheaton College; in 1953, Pres. John Walvoord of Dallas Theological Seminary; and in 1954, Prof. Harold Kuhn of Asbury Theological Seminary. We have had good leadership during the years. After the Cincinnati meeting, our meetings were held for the two following years in the East, in New York City. We then went to Wheaton, the next year to Chicago, and at the last meeting we were entertained by Shelton College.

We have had some good papers. At the very beginning, the papers were of such merit that they found their way into various journals and books and came before the public in this way. As to the papers read at the first meeting, some were included in the *Calvin Forum* and others published in *United Evangelical Action, The Witness,* and *Bibliothecra Sacra.* One of them was accepted for inclusion in the *Journal of Biblical Literature,* although I am not sure that it actually appeared in that publication. Through the years many papers read at subsequent meetings have been published, and others are being held in reserve with the exception that we will print them in volumes issued under the auspices of the Society.

There have been a number of literary products issued by E.T.S. It was several years before anything was done about duplicating the papers that were read at the annual meetings, but for the last three years we have duplicated these papers. They are issued as "printed but not published" and are available not only to members of the Society but to others who would like to have them. If there are members of the A.S.A. who would like to become regular subscribers to these papers, arrangements may be made by giving your names to Dr. Nicole.

Early in the history of the Society, a composite volume was begun. It has taken a long, long time to get the volume into form ready for the publisher. We thought that we would do well to come out with a volume that would deal with the attitudes which men of reputation through the years have had toward the Scripture, and their interpretation of Scripture; men such as Irenaeus, Augustine, Luther, Calvin,

Wesley, Sanday, Rowley, Niebuhr and Brunner. These were representative scholars. By examining their attitudes and seeing how they dealt with Scripture, it would be possible to erect guide posts and warnings as to the way in which we ought to approach the revealed Word of God. The project was very slow in developing but now that the Society has a new editor, I am sure that it will see the completion of the work very shortly. You may expect to see the volume in print very soon. (Dr. Walvoord is presently serving as Editor.)

This past year there came forth another book, the first of a series of monographs prepared by individuals holding membership in the Society—a book by Prof. Paul K. Jewett entitled *Brunner's Concept of Revelation,* a book which is very stimulating. It has been well received by evangelicals and has evoked interest in other circles as well. Many of you have seen it. We commend it to you.

Some of you have heard the doughnut story—the story of the street on which were located various doughnut shops. One of the shops put out a sign which said, "We have the best doughnuts in town." The next shop down the street put out this sign: "We have the best doughnuts in the United States." Another advertised, "We have the best doughnuts in the universe." The owner of the last shop was puzzled as to what kind of a sign he should put out, but finally produced one which read: "We have the best doughnuts on this street." We of E.T.S. are not ready to make great claims for our Society, but we do have a group which has, as a common basis of faith, acceptance of the Bible as the Word of God. We are very thankful for that. We have bridged some of the differences by getting evangelicals together for fellowship. Theological discussion has indeed been stimulated. Papers have been read. They have been well received and have been circulated rather widely. We were able to get Dr. Jewett's book published. He had submitted the manuscript to one publisher after another, and publishers said, "This is a technical book. If it were more popular, we would be very happy to publish it. We think it is a very lucid interpretation of Brunner, but we would have to accept such a great responsibility financially that we just don't see how we can handle it." E.T.S. found a publisher—a publisher who not only was willing to handle the book, and do it entirely upon his own responsibility financially, but who was willing to do it so that the members of the Society and their friends could have copies at a low cost. The publisher was so happy with the venture that he has expressed interest in considering any other manuscripts which the Society wishes to have published.

We have had fine Christian fellowship. At our annual meetings—held each year during Christmas vacation—we have been greatly blessed. For a period of time the number present at the annual meetings was small. Some said, "Is it worth the while for just a small group to get together to have the discussions?" But after two years of meetings in the East, we came to the Bible belt, the Middle West, meeting at Wheaton, and experienced a revitalization. The following year we had inspiring sessions in Chicago. We then ventured to go back to the East again. I wish to report that at present "The baby is in good health." The tide has turned. Today we come to a new milestone in the life and history of this organization as we come together with our Christian friends of the American Scientific Affiliation. We are not ready to put out the signs, but we are producing good "doughnuts," and we look forward to the day when it may be possible, with justification, to put out some signs. Thank you.

Definition and History of Biblical Hermeneutics

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Hermeneutics, in its generic sense, may be applied to any piece of literature since it is the theory of interpretation. Originally *hermeneutica* was used either with *episteme* or *tekne*, referring to the *science* or *art* of interpreting. Whenever we are confronted with the thought of man in speech or writing the need for interpretation arises, and the reason such interpretation is possible is due to the fact that we have been created in the image of God. This image, though debased and defaced through sin, was not altogether lost. We no longer have true knowledge of God, true holiness and true righteousness, but the natural man continues to be a rational, moral and cultural being. He is spiritually dead and ethically depraved, to be sure, but physically, psychologically, analytically, socially, biologically, etc. he still functions according to the laws God gave for his being, although here too there is impairment. Sin may bring about many misunderstandings, but we have not lost contact with our fellowmen. Interpretation of the spoken and written word continues.

But my subject in *Biblical* Hermeneutics. Therein lies the recognition that beyond general hermeneutics there are special considerations for interpreting Holy Writ. In his magnificent three volume work on theological Encyclopedia Dr. A. Kuyper places *Hermeneutics* between *Sacred Philology* and *Exegesis* and calls it simply, "the logic of exegesis." Exegesis, in turn, might well be called the conscience of theology.

Now if the Bible were nothing more than any other human production it would be difficult to maintain the need of a theological hermeneutics. For in every other kind of interpretation the general principles of hermeneutics as a philological science are applied and we never speak of the hermeneutics of medicine or law. However, in theology the theory of interpretation is organically united with and flows from the Scriptures as such. Consequently, historically the term "hermeneutics" has most consistently been applied to the rules for exegeting the Bible.

If Biblical hermeneutics is to maintain its unique position it must follow from the unique character of the Scriptures as the special revelation from God, inspired by the Holy Spirit and only truly understood under the guidance of that Spirit. In short, in the interpretation of Scripture there is an additional, supernatural factor, which is not found in ordinary interpretation. However, we must immediately add, that this special factor does not place the exegesis of Scripture beyond the rules of logic and of ordinary hermeneutics. For if the inspiration of the Spirit and the divine character of the Word gave to the Scriptures some sort of mystical meaning in the sense of *a Deus ex machina* there would then be no control whatsoever over subjectivism and no basic unity of meaning. Our Biblical (theological) hermeneutics must ever remain hermeneutics, i.e., a self-conscious analysis of the methods and rules of exegesis. For we must give ourselves an account of what takes place in exegesis, thereby making exegesis conscious of her task and guarding her against errors and deviations.

In short, on the one hand, "in so far as the Bible is exactly like other books, it must be interpreted as we do other works of literature. The Scriptures are written in Hebrew and Greek and the principles of forms and of syntax that would apply to the explanation of other works written in these languages and under these circumstances must be applied to the O.T. and N.T. also. Again, the Bible is written for men, and its thoughts are those of mankind and not of angels or of creatures of a different or higher spiritual or intellectual character; and accordingly there is no specifically Biblogic, or rhetoric, or grammar. The laws of thought in these matters pertain to the Bible as they do to other writings" (I.S.B.E. Vol. III, p. 1489, Art. *Interpretation*).

On the other hand, Biblical Hermeneutics is not a sub-division of general hermeneutics, but is a *Hermeneutica Sacra*. By that we refer to the super-human, divine character of the Book of which God is in a very special sense the author. And the simple application of ordinary hermeneutical rules will not give us the desired result. There is always an added factor in the interpretation of Scripture. For even though we understand the meaning of the secondary authors we may not understand what the Scriptures have to say. For the Holy Spirit is the primary author, and there is more meaning in the words of the secondary authors than they realized. We must, of course, admit that there is an analogy of this in the aesthetic inspiration of the poet, who often speaks more truly and profoundly than he himself realizes. However, beyond this ordinary human phenomenon, the church of Jesus Christ has in Biblical revelation the special message of its covenant God.

This special anagogical significance of Holy Writ is designated as the mystical meaning (of *Encyclopedie der Heilige Godgeleerdheid,* vol. III, p.p. 101, f) by Dr. A. Kuyper. He boldly asserts that the Scriptures themselves demand acknowledgment of this mystical element (of Gal. 4:24; Romans 15:4, 23; I Cor. 10:6, 11 in reference to Deut. 25:4). At the same time we do not deny or abolish the human authorship of the Bible. Since God is infinite and beyond all human understanding the very special question arises as to how we must proceed in exegeting Holy Writ, in order to find and set forth the meaning of the primary author. We must find the answer in the

Bible itself, for God's Word is self-authicating, it not only attests its own divine character, but also indicates in what manner its testimony must be understood.

We cannot simply apply the rules of general hermeneutics to the Holy Scriptures as a particular case anymore than we can subsume God under the concept being, as if his Being were basically like that of the creature; or speak of him as a variation of the genus spirit, thereby putting him in a class with angelic or human spirit. God's Word is not a species of the general concept *word,* on a par with the word of our finite existence; rather it is something in a class by itself.

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Before considering further what the Scriptural definition of hermeneutics is it will be profitable to present a short history of hermeneutical principles applied throughout the ages. These are not in themselves normative but must be examined in the light of the Word. Most histories go back to the Jewish manner of interpreting Scripture, but let it suffice us to begin with the early church. The congregation received the Old Testament as the Word of God together with the Jews, but they now saw it in an altogether new light. They took their cue from the Lord who had before and after His suffering declared that the Old Testament spoke concerning him. They also traced the types of Christ in person and work, thus introducing the typical and allegorical approach. No doubt this manner of placing everything in relationship to the Christ has good ground in Scripture, but a caution ought to be expressed against losing sight of the historical as such and giving the text a purely allegorical meaning a la Philo; and, secondly, taking as allegorical that which is not presented as such in Scripture. Arbitrary allegorization after the manner of the Alexandrian school of the Jews, under influence of philosophy, can be seen in Clement of Rome and Justin Martyr, whose *Logos spermaticos* is not a truly Scriptural concept but borrowed from heathen philosophy.

Soon three schools of interpretation are discernible, between the years 170 A.D. and the fifth century. First there is the Western including Ireneaus, Tertullius and Cyprian. The emphasis is on the agreement with the *regula veritatis* and tradition. This was necessitated by heretical movements such as that of Marcion, Gnostics, Montanists, etc., with their arbitrary interpretations of Scripture. This movement deteriorated into pure traditionalism which found its expression in the famous dictum of Vincentius Lerinensis, "Even so we must take great pains in the catholic church to hold fast that which has been believed everywhere, at all times and by all; for that is truly and in the real sense catholic and universal". As if there ever was such a thing! This over-emphasis, however, must not close our eyes to the value of the rule of faith and the ecclesiastical tradition for Scriptural interpretation. Although tradition and confession may not overrule exegesis as is the case with Roman Catholicism today yet they may serve as a brake against hasty, superficial and wrong exegesis.

Secondly, the Alexandrian School, known as the allegorical, must be distinguished. The moving spirits were Clement of Alexandria and Origen. Although divine inspiration of Scripture was acknowledged, there was a one-sided ignoring of the concrete historical given and an almost exclusively allegorical interpretation. What was right and proper for God was sometimes subjected to human reason and philosophic considerations, and the divine injunction to make every thought subject to the obedience of Christ (II Cor. 10:5) was not seriously applied.

It must not be concluded that the allegorical method in itself is reprehensible, but it may not exceed the rules given in Scripture. Its proper application in certain cases may be derived from passages such as Gal. 4:24; I Cor. 10:6; Heb. 9:9; Jn. 3:14. Augustine called the allegory a figure of speech in which out of one the other is understood.

According to Origen, who was the genius of this school, Scripture has a three-fold sense just as man in the Platonic sense consists of body, soul and spirit. The bodily sense is the grammatical one, the literal meaning; the psychical or moral sense, which teaches us by the example of others how we ought to conduct ourselves (note: in practice this was mostly neglected); and the spiritual sense, designated as *anagoge, allegoria.* Every Scripture, indeed, has the spiritual sense, but not all of Scripture has a literal sense for Origen. In the third place, there was the school of Antioch, or grammatical-historical school. This method turned against the allegorical and inquired into the literal and historical meanings of the text and is a forerunner of those who today will not allow that the O. T. Scriptures refer to the Christ of God, and, that the Psalms, e.g., refer merely to the times of Zerrubabel and Hezekiah. In short, the Scriptures lost their reference to the primary author and thereby their divine character. To this school belonged Theodore of Mopsuestia, Chrysostom, et. al.

Finally, Augustine calls for special mention, since, although exegesis is his weak spot and he does not always live up to his hermeneutical rules, he has given the church many excellent directives in his great work on Christian Doctrine (*De Doctrina Christiana,* libri IV).

For Augustine the primary principle was that the fear of the Lord is the beginning of understanding of the Word of God. In humility we must accept the authority of Scripture. But the exegete must be well equipped philologically, historically, and critically. The literal meaning must be ascertained and thereafter the allegorical or mystical. First the meaning of the human authors and through this the meaning of the primary author. A text may not be severed from

its context. All Scripture is not equally clear and the obscure passages must be interpreted in the light of the perspicuous. We must proceed in our work with great care and diligence, but if at last some obscurities remain, these do not pertain to our salvation.

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The middle ages do not offer us anything original. Many *Glossaries* appeared, i.e., collections of the interpretations of the church fathers. Great ignorance prevailed so much so that bishops had to be urged to read the Word and it became a common saying later that a school-boy in Geneva had more understanding of the Word than an ordinary parish priest. The highest virtue was to follow tradition, which finds expression in the rule of Hugo of St. Victor: "First learn what one must believe, and then go to the Word to find it". If there were great diversity among the fathers it was necessary to accept *quod ubique, quod semper, quod ab omnibus creditum est.* There was no freedom and no new hermeneutical principle was developed. There was a great activity in gathering and collating various Scriptural interpretation in *Catenae* (Aquinas, most famous in West) and Peter Lombard sent his famous *De Libre Sententiarum* into the world. A fourfold interpretation, going back to Augustine, was accepted: the historical, the aitological, the allegorical and the anagogical, the last three all belonging to the spiritual undertsanding of the Word.

Although the doctrine of a fourfold interpretation is to be rejected, we must not lose sight of the fact that God speaks in the Holy Scriptures, although through the service of man, and his thoughts are higher than our thoughts.

Even before the Reformation began there had been a re-awakening in the study of the Word in such men as Wyclif, Valla, La Fevre, Erasmus, and Reuchlin. The Renaissance showed its influence in a renewed study of Greek and Hebrew so that Reuchlin wrote a Hebrew grammar and Erasmus translated the New Testament. They stressed the necessity of studying the Scriptures in their original languages.

The Reformers proceeded on the basis of strict inspiration but not in the mechanical sense (some of their followers did). This doctrine of the infallible Word was opposed to that of an infallible Church. They held that not the church determines what the Word teaches, but the Scriptures determines what the Church ought to teach. Primarily the literal sense of Scripture must be sought, and furthermore, the Fathers are not authoritative but the comparison must be made with the rest of Scripture. Their basic priciple was: *Scriptura scripturae interpres.* Scripture is *autopistos,* i.e., must be believed for her own sake, and we may not subject her to reasoning and proof (Cf. Inst. I, 7, 5). To rightly understand the Scriptures we must receive new sight (Calvin Comm. on II Tim. 3:16). The Apocrypha do not belong to the Scriptures. The authentic text is found in the original languages, therefore these must be studied.

Arbitrary allegorization must be rejected and one must be on guard against personal speculation and *eisegesis* (reading into the text). Both Luther and Calvin reject the fourfold sense of Scripture and seek to find the one meaning of the Spirit (Cf. Calvin Comm. on Gal. 4:22). The necessity of grammatical understanding and historical acumen is stressed, but the *analogia fidei* is not to be abandoned. The obscure passages must be interpreted by the clear, a golden rule that should have been observed in these latter days in connection with an understanding of the return of Christ.

Luther especially distinguished himself as translater of the Word, while Calvin wrote commentaries on practically all the books of the Bible. Dr. Warfield makes the following comment on the latter. "It was doubtless in part to his humanistic training that he owed the acute philological sense and the unerring feeling for language which characterize all his expositions. . . . Calvin was, however a born exegete, and adds to his technical equipment of philological knowledge and trained skill in the interpretation of texts, a clear and penetrating intelligence, a remarkable intellectual sympathy, incorruptible honesty, unusual historical perception, and incomparable insight into the progress of thought, while the whole is illustrated by his profound religious comprehension. His expositions of Scripture were accordingly a wholly new phenomenon, and introduced a new exegesis—the modern exegesis. He stands out in the history of biblical study as, what Diestel, for example, proclaims him, 'the creator of genuine exegesis'." And a little further Warfield quotes the "judicious Hooker" to the effect that the sense of Scripture which Calvin allowed was of more weight than ten thousand Augustines, Jeromes, Chrysostoms and Cyprians. "Nor have they lost their value today" (Cf. *Calvin and Calvinism,* pp. 9, 10).

Over against the Reformation Rome confirmed and continued the errors and deviations which had accumulated in the course of centuries, in the Council of Trent 1545, placing tradition on a par with Scripture, accepting the Apocrypha as inspired, relying solely upon the Vulgate as being authoritative instead of the original Mss., and declaring that all obscure and difficult passages ought to be referred to the Church for final disposition.

In Socinianism we find the beginnings of Rationalism, *viz.,* that approach whereby reason is taken as final norm and authority of the possible and one is not content to use it merely as a means of coming to knowledge. Only doctrinal passages were inspired and in the rest the writers might easily have erred, while the O.T. has merely historical relevance. Mistakes could be discovered by historic criticism, and nothing that is contrary to the healthy human reason ought to be accepted.

Meanwhile the more mystical Anabaptists made a distinction, or rather posited an opposition between Scripture and the Holy Spirit. The Scripture is not the veritable Word of God, but merely a dead letter behind which the true Word must be discovered through the Spirit. For the spiritual man the Word becomes superfluous. Illumination is not distinguished from inspiration. This error, sad to say, has continued to this very day in some sects and among some church members the Spirit and the letter are still opposed to each other.

The Remonstrants, among whom were Grotious, Episcopus, Wetstein, etc., placed such emphasis on philology and grammar that the divine factor was not properly evaluated but rather negated, and the end result was a swing to Rationalism. Rationalism, as such, appeared under the influence of De Cartes and Spinoza and finds expression in L. Meyer's *Philosophia Scripturae interpres*, 1666, as well as Kant's *Die Religion innerhalb der Grenzen de blossen Vernunft*. The latter called for morally garbed rationalistic interpretation of the Scriptures. He asks the question, "ob die Moral nach de Bibel oder die Bibel vielmehr nach der Moral ausgelegt werden músze", (K. Kehrbach ed., S. 116 as quot. by S. Greydanus in *Schriftbeginselen ter Schriftverklaring*, pp. 198, 199).

Kant is of the opinion that the moral betterment is the real goal of all rational religion, therefore this ought to be the principle of all Scriptural interpretation. This was further developed by H.E.G. Paulus and the German critical school, in which Rationalism degenerates into Naturalism. Scripture is not accepted for what it claims to be nor interpreted according to its own meaning. No account is taken of the darkening of man's mind through sin or the corruption and depravity of his heart due to the fall of Adam and Eve.

The Historical School

In passing mention ought to be made of J. A. Ernesti who so emphasized the grammatical meaning of the words that Holy Writ has no future meaning and is comparable to any other book; and also J. S. Semler, who, although he did not wish to be counted among the rationalists nevertheless advanced its cause and its prominence by his one-sided emphasis upon the historical method and by relying upon the *accommodation theory*, holding that Jesus adjusted himself to the views of His day. Of both these men J. Wach has this to say: "Die Namen der beiden Manner bezeichnen den Anbruch einer neuen Epoche in der Geschichte der hermeneutische. Theorie, die gekennzeichnet wird vor allem durch die Losung der Auslegunglehre vom Dogma, die Verlegung des Schwerpunkts nach der Seite der grammatisch-historischeh Interpretation. . ." (*Das Verstehen*, 1926, S. 17, 3).

In passing mention ought to be made of J. A. Bengel, who stands out in the school of Pietism, which was a reaction against the sterile intellectualism of the 17th century. Especially Spencer and A. H. Francke reacted with holy indignation to the arid scholasticism in biblical interpretation. They stressed the need of prayer for guidance of the Spirit so that edification might be achieved. Science gradually was neglected and the grammatical, historical and analytical study of the Word could only reveal the external wrappings of the Word according to their view.

Mention ought to be made of D. F. Strauss, *Leben Jesu kritisch untersucht*, who in opposition to both the Naturalists and Supernaturalist proposed the Mythical interpretation. The N. T. had developed as a Myth said Strauss and now to understand it we must see that development for what it is (CF. the demythologizing of Bultmann). Baur and Tubingen school brought an end to this influence temporarily by their Peter-vs.-Paul scheme, which was transferred by the Graff-Welhausen-Kuenen school to the O. T. claiming to interpret by an objective-historical method, but actually on the basis of an evolutionary philosophy. Fact of the matter is that already F. D. E. Schleiermacher, who has been called the Origen of Germany and issued *Hermeneutik and Kritik*, 1838 posthumously) had substituted the subjective, psychological method or interpretation, whereby he did despite to the objective validity of the Word of God as authoritative. This was developed in a slightly different direction by the comparative religion approach by which everything was relativized and attempts were made to show that there was nothing distinctive in the religion of Israel.

Concluding this rationalistic, evolutionistic trend I wish to mention finally the *Formgeschichte* theory of interpretation. This was started by H. Gunkel in *Schopfung und Chaos, 1895* with respect to the O.T. and continued by M. Dibelius, *Die Formgeschicte des Evangliums*, 1918, while E. Fascher in 1929 wrote a history of this movement: *"Die Formgeschichtliche Methode."*

This method does not proceed on the assumption of the historical veracity of the historical books of the Bible but rather their untrustworthiness. It is plainly the work of man and inaccurate in many details. The problem for this school is to find out what may be considered historically reliable and accurate. Supernatural facts are simply discounted, and the great quest is to find out what really took place, from which the myth and legend as presented in the N. T. grew. This method, of course, takes the very essence of Christianity, the supernatural works of God for His people, and the infallible revelation which he has made, and destroys them without residue. This is the apotheosis of the natural man, and the end of true religion.

Happily not all the 19th Century, scholars landed in this maelstrom. Mention ought to be made of C. A. G. Keil, who wrote *Lehrbuch der Hermeneutik des Neuen Testaments*, 1811. He advocates the gram-

matical-historical method, and holds that the grammatical interpretation must be according to the historic milieu. He held that to know the sense of a book is nothing else than to think as the author thought when he wrote and wanted others to think in hearing and reading. The chief criticism we have is that the not sufficient account is taken of the primary author.

During the last part of the 19th Century there was a resurgence of Reformed thought especially in the Netherlands which produced several works on Hermeneutics—viz., *Beknopte Bijbelsche Hermeneutiek,* L. Berkhof, in early part of this century, published in Holland. In 1929 Dr. F. W. Grosheide, who together with several Reformed scholars had published a Commentary on the New Testament which is being revised and re-published today, also sent his *Hermeneutiek* into the world. And in 1946 S. Greydanus of Kampen Theological School of the Reformed Churches of The Netherlands wrote his *SCHRIFTBEGINSELEN TER SCHRIFTEVERKLARING,* together with a short resume of the history of hermeneutic theory. The viewpoint of these Reformed scholars is being presented in this paper.

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I now turn to a more detailed consideration of some of the Scriptural principles of interpretation. Many things cannot be mentioned and those that are mentioned cannot be adequately treated. I pass by the question of the necessity of interpretation due to objective and subjective difficulties since that would lead us far afield. The problem of communication, of understanding another human being is forever plaguing all of us; how much more the possibility of understanding the special revelation of God, for He is infinite and we are finite and the finite cannot comprehend the infinite. And His thoughts are not always revealed directly but mediately through angels, and men; in concrete historical situations and in acts of power, and always we must remember that God speaks anthropomorphically.

But in spite of the objective difficulties and our alienation through sin, yet the possibility of understanding Scripture and learning to know God is given in the fact of our creation in His image and in His condescending grace to hell-deserving sinners so that He gives them after sin, both "new light and new insight," to use Warfield's happy phrase. There is, indeed, the possibility of a partial understanding of Scripture among the unregenerate (all men have a *sensus deitatis* and even the demons know some theology) but for a true understanding of the Word of God the renewing power of the Holy Spirit is necessary. This enlightenment must not only take place in general but even with respect to particular passages (Cf. Luke 24:45 "then opened He to them the Scriptures").

The first principle of Biblical Hermeneutics in the orthodox tradition is the fact that the Bible is actually and in the literal sense God's Word. It is His self-revelation. As such the Lord Jesus recognized and applied the Word (Cf. John 10:35, Matth. 4:4, 7, 10, etc.) and thus also the disciples understood the Word.

Secondly, the Scriptures are God's Word, through the service of men, i.e., the Bible did not fall from heaven as Diana or spring full-orbed from the brow of Zeus as Minerva, but God used human agents as organs of revelation over a long period of time in many lands. Hence the ordinary rules of logic and interpretation do apply.

Again, the unity of Scripture is a principle which follows from the first principle, since there is one primary author, who is divine and beyond fallibility or error. There is unity, moreover, of content, purpose, authority. This involves that we do not grant contradictions in Scripture, though we may grant seeming contradictions, paradoxes. The very center of Scripture is the incarnate Word—God was in Christ, says Paul. He spoke in times past through the prophets, hath in these last days spoken through His Son. This means that revelation is soteriological. Christ is the Key to the Scriptures.

Now the question may arise, Where do we find these principles in the Word? We cannot use the Bible as a hermeneutical text-book any more than we can say that it is a text-book for a certain physical science. But these principles are spread through the Scriptures and we must apply ourselves to know the will of the Lord and the meaning of the Spirit. Much may, e.g., be learned from the way Scripture interprets itself, but also from the mighty acts of God and His continuing providence wherein we see the fulfillment of His word. E. g. Gen. 3:15 received its fulness of meaning only by knowing the work of Christ for the salvation of mankind, while Gen. 2:17 concerning the threat of death to Adam and Eve is daily being fulfilled in all men and in the lost in hell. The O.T. becomes clear in the light of the new!

The organs of revelation themselves and the apostles show us the way in interpreting Scripture. E.g., Peter tells us the meaning of the prophecy of Joel about the last days and James tells the first Synod at Jerusalem that the conversion of the Gentiles as attested by Paul and Barnabas is the fulfillment of the promise of God to David that His tabernacle would be built and that His kingdom would be sure, thus cutting off in one stroke any physical, material worldly kingdom in the future for David's heirs.

Again, the Scriptures indicate something about the right way of interpretation by giving us various forms of writings and books of different character. O.T. Allis, e. g., used to tell us as Juniors in the Seminary that we may not use the same rule in reading Ex. 14 and 15, the one being written as straight prose and the other in exalted poetic form. The one tells us that God raised the waters of the Red Sea by a strong east wind, and the other speaks of the breath of His nostrils—but we ought to remember that God is not a man, therefore, this is poetic license just as when the poet speaks of

Lebanon skipping as a lamb. Again, we cannot take the highly symbolic prose of the book of Revelation and of Daniel—in certain parts—and read it literally as we do with the didactic prose of the Gospels of the Pauline Epistles.

But in all this we must not forget that Scripture is *autopistos,* i.e., the ground for her veracity is within her and she is herself judge and interpreter of her own meaning. The Word comes to us as absolute authority. Although God reveals Himself in nature and history and we can learn much about His ways and His glory from them, yet alone in Scripture do we have a clear and unequivocal self-revelation, so that He speaks to us in audible words and communicates His thoughts on various subjects. These two revelations are not, therefore, on a par, of equal authority. The Bible does not have to be confirmed by facts from nature before we give adherence to its pronouncements and accept its facts, it comes to us with the demand of implicit faith and obedience. We must believe the Word for its own sake as the Word of God. In the work of man and in his reasoning many errors may appear, but this is impossible with God. He is not a man that He should lie or make a mistake. The errors lie with us in our faculty comprehension. His Word is Truth, whether confirmed or contradicted by science. His revelation surpasses all human wisdom and His wisdom can only be achieved in His fear.

In general we must observe by whom, to whom, when, where, in what manner, under what circumstances and the occasion a thing is written. We must distinguish between the Word of God in formal and material sense. All is historically normative, e.g. the words of Satan and the false prophets are truly reported; but not all is ethically normative. Because of the organic character every part must be compared with every other and the sense of the whole must be kept in mind, i.e., the centrality of Jesus Christ as key to the Scriptures. But the dispensation of the Old Covenant and that of the New must be distinguished. All that God spoke to Noah, Abraham and Moses cannot be applied *ipso facto* to N. T. saints. Further, the particular and the general must be clearly distinguished. In this connection we may not absolutize that which God commands to particular persons. E.g. the prohibition against murder both to Noah and in the law and Paul's admonition to believers not to avenge themselves may not be applied to the government or to mankind as a social organism thus deriving pacifism and abolition of capital punishment.

Finally, let me conclude with a word concerning the matter of objectivity and presupposition in exegesis. In giving account of the matter this becomes a question of hermeneutics.

The interpretation of Holy Writ must be objective. Objectivity is here understood in the sense that the meaning and sense of Scripture must be reproduced in its purity and fullness, the thoughts of God must be clearly expressed, brought to light, without human admixture. Our Lord takes no pleasure in prophets that speak falsely concerning Him (Cf. Jer. 23:25-26) (Ezek. 33:7-9;) God was very insistent in sending His prophets that they should speak only His words and all that He commanded them. This still applies today. It means that we may not carry our meaning into the Scriptures. We must beware lest unconsciously we present our own desires, views and reasonings as the Word of God. We may not pass by part of the text because it does not agree with our preconceived notion. We may not twist or wrest the meaning of Scriptures to accommodate our ideas.

All of which does not mean that we can approach our task totally void of prejudice or presupposition. We do not subscribe to the dogma of objectivity and presuppositionlessness (Voraussetzunglosungheit). Those who followed this fad in exegesis wanted to approach the Bible as another ordinary book. But for the last 25 years the trend has changed and men like Bultman roundly admit that they stand on the basis of Heidegger's phenomenalism. So the question becomes rather, in how far may exegesis be determined by pre-judgments. Formally, because we are finite men, we cannot approach our task without prejudice; no man can jump out of his skin. Out of the heart are the issues of life, and as a man thinketh in his heart so is he; hence all his thinking and doing and loving will be determined by his subjective attitude for or against God. All men are either covenant-keepers or covenant-breakers. There is no escape from this formal aspect.

Materially, we may not come with a greater presupposition than the Scriptures themselves allow. Every believer starts, then, with the presupposition that the Bible is the Word of God and as such is reliable. This basic position determines one's whole philosophy and anthropology. Thus we have arrived at the boundaries of knowledge and are thrown back upon our faith. Thus it is with all men. Every theoretic judgment in the final analysis is found upon the non-theoretic priori-either faith in the Son of God as the way the truth and the life; or faith in man, his reason, his science, his infallibility to find the truth for the good life.

It is the task of hermeneutics among other things, that it does not permit the exegete to enlarge his material presupposition to include his dogma. The danger is always with us that our exegesis will be used in defense of dogma. On the other hand, let us not do despite to the Spirit of God who leads the church into the truth. Let us take into account the *analogia fidei* and not cast overboard the wisdom of the ages.

Finally, let us not absolutize our exegesis. We may not say that we now have the last word, since we know in part and see in part. We shall never exhaust the full meaning of God's revelation in Scripture. Our knowledge of Scripture is like that of a man admiring the *Nachwacht* of Rembrandt. The more he studies and the more he knows of lines and colors and paints the

more he will appreciate the painting of the master. But he never reaches fully that which was in the mind of the artist who made the painting. So in an infinite degree the divine artist is always beyond our understanding, although we shall understand more of his Word as we come with more undertsanding of the frame of reference mould in which it is cast. But ever it is the majestic Lord of heaven and earth that speaks to us. And only if we come in faith and hear His voice obediently shall we find eternal life through that Word.*

*(For discussion of last point Cf.

DE bevooroordeeldheid der exegese, by Dr. R. W. Grosheide, 1946)

Bases of Scriptural and Scientific Investigation

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It is significant for the history of evangelical Christianity that two groups of scholars whose interests are generally thought to be quite distinct should be convened to discuss interrelationships between Biblical theology and the sciences. The popular trend is to view them as basically unrelated as I shall have occasion to indicate in this study. But it is my own hope that whatever the results of this particular conference, some of the groundwork will be laid for an increasingly cooperative investigation of apparent problem areas and hence for the promotion of true Christian scholarship for the glory of God both in the sciences and in Biblical studies.

As members of these organizations we find ourselves in agreement in at least three fundamental areas. (1) Our respective societies are composed of men and women who are Christian in more than the normal sense of that word. We are united in the profession of personal faith in the Lord Jesus Christ the Son of God as Savior. This is the indispensable basis for becoming a Christian. (2) Members of both societies accept the full authority of the Bible as God's Word. This is perhaps the central factor which makes this joint conference unique on today's theological horizon. The doctrinal affirmation of the Evangelical Theological Society is the brief but comprehensive statement, "The Bible alone and the Bible in its entirety, is the Word of God written and therefore inerrant in the autographs." It is difficult to see how one can really be considered a *Biblical* Christian—though some may be believers in Christ—if one rejects this core of truth. Certainly from the point of view of the Christian theologian one's attitude toward the Bible as the authoritative Word of God is a basic issue today. We maintain with Christ that "the Scripture cannot be broken." (John 10:35). (3) It follows that we should be agreed in our confession of the sovereignty of the God of the Bible. The American Scientific Affiliation in its doctrinal platform lays emphasis upon the fact that there is one sovereign God who is "the Author of the Book as well as the Creator and Sustainer of the physical world about us" with the added correlary that there can, therefore, "be no discrepancies between Biblical statements and scientific observations when both are properly interpreted." The A.S.A. volume, *Modern Science and Christian Faith*[1] went a long way towards exhibiting this harmony in scholarly fashion.

For the purposes of this study I shall assume that we meet as Christians humbly grateful to Almighty God for His love and saving grace. What I shall have to say will pertain to the second and third factors: the investigation of Scripture taken as Divine authority and the investigation of the physical, biological and human-social realms taken as aspects of reality owing their origins and the continued process of their existence to the theistic, Creator-God of the Bible. The limitations of our topic do not permit a defense of these presuppositions but what we shall have to say will be pertinent to such a defense.

I. Purposes and Working Assumptions

It is the purpose of this paper to consider the nature of an interrelation between investigative activity in the sciences and that involved in the understanding of that special body of literature known as the Holy Bible.

To this end I shall labor under the assumption, which I believe to be justified, that the intelligent investigative procedures employed with notable success in the physical sciences involve a rigorous and fundamentally healthy type of critical thinking which can and does *illuminate* the investigative methods to be employed in the social, historical and theological sciences. We readily admit at the start that each science, including systematic Biblical theology, has its own scope and objective, its own category and terminology, its distinctive investigative techniques which prove fruitful *because* they are appropriate to specific subject-matter or contexts and problems. Yet there are at least two natural factors which lead us to suppose that knowledge and reality are, or ought to be, integrated and hence, mutually illuminating. These two reasons are consistent with and a partial confirmation of presupposition three, with which we agreed to begin, namely, that there is one sovereign Creator-God behind both the universe and the Bible.

The first reason why we take the sciences to mutually illuminating is taken from scientific theory working toward unification. Here I find myself in agreement with scientists like James Clark Maxwell, who argued for an analogical relationship between the sciences which he called "physical analogy." He said, "By physical analogy I mean that partial similarity between the laws of one science and those of another which makes each of them illustrate the other."[2] Maxwell's own theory of electrodynamics took into account phenomena of electromagnetism and thus prove to be more comprehensive than the Cartesian-Newtonian view of mechanical motions. And now we have the theory of quantum mechanics with its attempt to include, among other things, the foundation of the chemical elements in electrical energy.

No doubt the last word has not been said on the matter, but I do not believe the present status of physical theory justifies the feeling of some that consistency and continuity have gone by the board!

I like the humor more than the philosophy behind Sir William Bragg's statement that physics uses "the classical theory on Mondays, Wednesdays and Fridays, and the quantum theory on Tuesdays, Thursdays and Saturdays."[3] When the historian of science Sir William Dampier suggests the possibility of a third set of ideas for Sunday—the religious. I just don't like it. Behind such an incoherent world view is the assumption of a Kantian dualism in which religious faith is a matter of the will or feelings, while science is said to be an outcome of reason. I have argued the dangers and non-necessity of such a view elsewhere.[4] We may simply remark here in passing that Christian faith involves the conviction of the *whole* man with the aid of the Holy Spirit and in the light of reasonable evidences. Such a viewpoint stands in sharp contrast to neo-orthodoxy and neo-liberalism. It is a view which is, I believe, consistent with Scripture as well as affording a vital point of contact between Christian evidence and the sciences.

In any case, the measure of success thus far attained in the physical sciences toward a unified field theory is indicative of their analogical character and their illustrative interrelationship. In addition, I find myself in general sympathy with the efforts of Kurt Lewin, Ernst Cassirer, and others[5] to extend this analysis to the social sciences, and, I would add, the historical and theological sciences. In the total system of true knowledge each branch of study may illuminate the methods and basic questions of the others. Of course, one can push the mathematical-quantitative side of the physical sciences and the qualitative-creative side of the social studies.[6] Indeed it is important for the sake of clarity and for the fruitful focus of limited human abilities that we do not lose sight of important distinctions between investigative contexts. But without any intention of "reducing" one discipline to another, it is important not to overlook unifying similarities in the midst of essential dissimilarities.

There is a second reason why we feel justified in expecting to find illuminating points of interrelationship between different areas of knowledge, including science and theology. This reason is a methodological one and is really basic to the first and more theoretical consideration. I have in mind the scientific method which the empirical sciences have in common, and which in the generalized form of its logic of critical thinking is basic to the investigation of the Scriptures as elsewhere. This brings us to a consideration of some of the essential features of the logic of science.

II. Investigative Activity in the Sciences

Investigation is systematic inquiry or research. As a human activity investigation is stimulated by various lines of interest and by prevailing problems. Relevant to specific problems and interests it can be said to be an activity which involves appropriate procedures for the acquisition of relevant data and the interpretation of that data within a meaningful, consistent and perhaps useful system of thought.

When we become self-conscious concerning that function of man directed toward the acquisition and systematization of knowledge, we see that it involves actions and ideas not uncommon to daily life. As Victor F. Lenzen has said in his *Procedures of Empirical Science*,[7]

> Simple experimental techniques are also used in the ordinary conduct of life. The child learns the operations of counting, of measuring length and time, of weighing with a balance. The builder uses tools, the housewife applies heat to produce the chemical reactions of cookery, the farmer cultivates crops. Such procedures are based upon prehistoric discoveries and inventions which have become the heritage of the race. In our historic era empirical science criticizes, augments, and systematizes practical experience.

Science, like philosophy, seeks to refine and augment where necessary the "common sense" of ordinary life and to be more consciously discriminating and systematic in its approach to problems—practical and theoretical—arising in daily life.

Observation, of course, is fundamental to the sciences, so much so, that it is rather fashionable to suppose that science is comprehended in the slogan, "Get the facts!" This is a useful motto if it is not conjoined with a distrust of reason's role in the acquisition of truth. To put the point briefly we may say that what is needed to solve a problem or to satisfy an intellectual interest is to get all the *relevant* data, facts that have *something to do* with the question at hand. Obviously the rational ability as well as the "know how" of the investigator is called for here, whether scientist or theologian. Ideas must be employed as guiding hypotheses in seeking out the facts and in establishing and defining their relationship to the problem at hand. Experimentation and verification, of course, involve a constant return to the facts as well as to systems of interpretation.

Morris Cohen[8] gives us an interesting example of

the healthy interplay between "well-reasoned ideas" and facts in the initiation of discovery.

> Surely Newton was not the first to see that the moon revolves about the earth, and that apples and other objects fall to the earth. But no one before Newton saw embodied in all these phenomena the common mathematical relation which we call the law of gravitation. To look for and see the latter, one had to have the following in mind: (1) Galileo's law of falling bodies and Kepler's law of planetary motion, (2) the analysis of circular motion into centrifugal and centripetal components—according to the principle of the parallelogram, and (3) the daring and unorthodox speculative idea (which Newton derived from Boehme and Kepler) of a parallelism between the celestial and the terrestrial realm.

I suspect that point three was not so "unorthodox" as Cohen supposes for a Newton who believed in one God behind and working through the universe, but the example points up the interplay between facts and reason.

The "observations" of science employ not only the telescope and the microscope, but also the use of physical principles, i.e., explanatory hypotheses, as instruments in the interpretation of microphysical entities. This is illustrated in the scintillation of a screen by a high-speed alpha particle, in the ionization of molecules in a cloud chamber producing water vapor condensation with a resultant track of water drops, and in the detection of radio active elements through the actuation of a Geiger counter.[9]

I know of no Geiger counter techniques for detecting the truth of Scripture! But what makes such developments possible? Controlled, quantitatively measurable experiments? Yes, but also the co-operative efforts of men observing and experimenting *within* the framework of guiding theories of laws and principles believed to hold for the field of investigation. The scientist must stand within this framework to get his results. So, too, the Christian who stands within the presuppositions enumerated at the start of our study, and who wishes to properly understand the data of the Bible, must have a like rational and rigorous concern for the evidence together with the principles of Biblical interpretation appropriate to the understanding of literature. There is in the generalized scientific methodology, we repeat, a principle drawing scientific and Scriptural investigation together in illuminating fashion.

Certain qualifications and recommendations begin to suggest themselves after this hasty appraisal of the investigative methodology of the sciences. We shall list some of these at the conclusion of our paper. We turn now to the principles of Scriptural interpretation.

III. Investigative Activity and the Scriptures

The increasingly popular way to approach the Bible is to make a distinction between the "core of the faith" in the Bible and the verbalization of the faith. It is claimed that one cannot employ to any degree the mental rigor of the scientific method in dealing with the "core of the faith," but one can freely—indeed, almost with a simple shrug of the shoulders—say that the Bible as a verbalization of the faith is full of error and that it is clearly incompatible with science. Because of the subjective nature of such a distinction it follows that what is meant by the "core of the faith," the "Word of God" within the Bible varies with the particular neo-orthodox or neo-liberal existentalists-speculative theologian. Men as different as Edwin Lewis[10] and Paul Tillich have tried to settle on some kind of objectivity in "the Word become flesh" or "the Jesus which is the Christ."

There are vital issues involved here, but I shall not try your patience by discussing them in this paper. We note only that subjective standards of men—however sincere some of them may be—have replaced the authority of "all Scripture." But if the Bible claims to be the Word of God,[11] and if all the relevant evidence tends to confirm this claim, then evangelical Christians cannot be satisfied with this wholesale "solution" of problems involving science and the Bible.

The Christian who takes the Bible seriously cannot "adjust" by adopting a "lower" view of the Bible in spite of the popularity of this "way out." The internal and external evidence for the authority of the Book is too conclusive for the honest doubter to brush it aside. The Lord has privileged us to live in a day not only when the challenge is great but also in a day when archaeology and the study of cognate languages and the cultures contemporary to Biblical times are providing a wealth of data confirming the historic convictions of the Christian Church that the Bible is indeed inerrant.

The article on "Biblical Archaeology" in the non-evangelica *Harper's Bible Dictionary*[12] states:

> Findings have not been conducted with an *a priori* viewpoint of "setting out to prove that the Bible is true"; but time and again irrefutable evidence has corroborated various Biblical narratives, like the siege of Jericho, the backgrounds of the Patriarchs, and the economic background of the Hebrew monarchy under Solomon . . . Nothing has been found which lessens the preeminence of the Bible as a unique religious document and masterpiece of literature. Little or nothing has been found to disturb the faith of Jew or Christian.

Whatever else it may be that keeps men from returning to a "high" view of the Word it must neither be a fear of scholarly research among evangelicals concerning possible reinterpretation of problem passages nor a faulty impression left before the world of the true meaning and effect of inspiration.

Warfield has said that "the doctrine is that the Bible is inspired not in part but fully, in all its elements alike,—things discoverable by reason as well as mysteries, matters of history and science as well as faith, practice and words as well as thoughts." But we must be quick to add that this does not mean "mechanical dictation." Inspiration of Scripture means that the Holy Spirit acted in the lives of the writers of the Book so as to preserve them from error and

contradiction in what they originally write as well as leading them to convey the thoughts in meaningful words which God wished conveyed to men's minds. But this did not necessitate dictation.[13] In the complex process of the composition of the Bible the writers possessed freedom to choose between possible words and phrases suitable to the purpose of expressing the mind of God. Their individual backgrounds and preparations (through natural cultural influences as well as more directly by God's Spirit) were undoubtedly causitive factors in determining the choice of some of these words. Hence the importance of learning all we can about these backgrounds for an adequate approach to Scripture. The subject matter itself influenced the style of writing. But in all, in the actual composition of the Bible the writers were preserved from error (were not free to err).

It is a problem of the science of hermeneutics to determine the proper contextual meaning of words or passages. The logic of its method is essentially the same as that already outlined. Like any science this is an ongoing process—well established in its essential outlines but not fixed in every detail. At times it is the physical or social sciences studying God's general revelation (though they may not own it as such) in nature and man which suggest new slants of interpretation of details, new perspectives and clarifying emphasis. If these suggestions are based upon facts, they are just as desirable to hermeneutical study as the study of cognate languages, of the cultures, and of the geography and history of the times of the Biblical writers.

The sciences may reveal new limits within which we may need to understand exactly what it is the writers originally intended to say. Theology is a science and thus it also gets molded accordingly even as in the past false theologies have led this science to sharpen up its definitions and expositions of unchanging fundamental doctrine.

The nineteenth century Scottish theologian, Robert Flint, emphasized the idea of progress in the development of Christian theology. He did not agree with Charles Hodge that the task of the theologian is simply to systematize the facts revealed in Scripture. For Flint the task included the facts of general revelation and culminated in a general philosophy of religion. "the one general theological science."[14] I shall not debate this difference of opinion, nor defend Flint's version of progress in systematic theology. The principle of development is sound even if we restrict our attention to the systematic investigation of Scripture. An interpretative science may develop. The presentation of the theology will change both with the accumulation of knowledge and with the attempt to meet current challenges with Scriptural truth. The principle of development here seems to me to serve as a good warning against unquestioning reliance upon even a Christian theologian's total system of thought.

The solution, of course, is not to forsake creeds and our Biblical-Reformed heritage and "get back to the Bible times," even if it were possible to retrace history. We are grateful for the lives and investigative work of nineteen centuries of true Christian men and women.

Nor is the answer to be found in the popular slogan, "God says it, I believe it!" unless one is sure *what* it is that God has said. Fortunately, the Bible is quite perspicuous on all the essentials of its central subject-matter: sin, salvation and the Christian life.

Charles Hodge [15] sees a good balance between the right of private judgment and the perspicuity of Scripture. Bible believing protestants, he says, hold to a common faith

> which no man is at liberty to reject, and which no man can reject and be a Christian. They acknowledge the authority of this common faith for two reasons. First, because what all the competent readers of a plain book take to be its meaning, must be its meaning. Second, because the Holy Spirit is promised to guide the people of God into the knowledge of the truth, and therefore that which they, under the teachings of the Spirit, agree in believing must be true.

Hodge here is speaking only of the plainly revealed doctrines of the faith.

But *all* is not fixed and settled. Differences of interpretation appear and some of them in areas of potential relationship between the sciences and Scripture. We may push Hodge's recommendations and urge that under the guidance of the Holy Spirit and with diligent cooperative investigation we seek the plain historical sense of Scripture, that is, the sense that it had when written and to the people to whom it was addressed, and that we use both Scripture to explain Scripture and relevant extra-Biblical knowledge to explain Scripture, remembering throughout the quest that truth is ultimately one. We ask, what is it that God has said? What is it that the writer was trying to put across here? The intelligent Christian under such circumstances cannot afford to feel that he has the final interpretation.

This does not mean that the Christian's attitude toward the Bible is thrown into a state of flux, nor are the essentials of our faith put on shaky ground by reserving an open mind as far as the evaluation of some of the details of Scripture are concerned. The Christian can ill afford to go underground here (merely holding on to received opinions) nor will he be driven into an unhealthy state of skepticism. Rather, he will rest upon the great bulk of Scripture whose meaning is well established and will, in cases open to several interpretations, seek to understand and to apply whatever is true from other disciplines in his investigation of Scripture.

IV. Qualifications and Recommendations

1. We have had no thought of limiting experience to the rational investigative type recommended in this paper. The *application* of truth to every aspect of one's life for saving faith and Christian growth, the guidance of the Holy Spirit, the love of God and of

men, can *neither* be comprehended in critical investigative thinking *nor* carried out in healthy fashion apart from it.

2. It follows that I would agree with fundamentalist scholars and others who criticize the Logical Positivist's tendency to make a god out of science. The dogma that "only" science yields truth is, however, no more fallacious than the dogma that science yields no truth, or that it is "merely" descriptive. If these characterizations hold for studies of nature they hold for the science of hermeneutics.

3. We need a Christian world view which includes a positive approach to science, not a negative *attitude*. This is essential for reaching the minds and hearts of men with the challenge of the Gospel as well as for a system of truth which is based upon the full revelation of God. Dr. Jaarsma[16] has put it well when he said that the Christian student of research must "recognize the validity of the scientific method in the gathering and classification of data, in the formulation of hypotheses, and in the verification of hypotheses. He uses this method, however, acknowledging not only its limitations . . . but employing it rightly oriented in the presupposition of Christian thought." And as Dr. John DeVries[17] has said, "Truth can be obtained only by a proper evaluation of the dependence of these fields (science and Christian theology) on each other and not by ignoring one at the expense of the other."

4. Concerning this Christian world view I agree with Bernard Ramm, whose *The Christian View of Science and Scripture*[18] has been a valuable stimulation to my own mind, that the Bible does not contain a developed cosmology. But, as I know he is aware, passages like Genesis one involve certain assumptions of a limiting as well as positive character—e.g., that the whole universe owes its existence to the power of God and owes the form of its continued existence to the creative and sustaining plan of God. The Bible has something to say to science which is determinative for its controlling assumptions. I would therefore recommend to the qualified Christian scientist that he seek an accurate and clear wording of his assumptions and the implications thereof *with due regard to* the pertinent truth of Scripture. This, of course, requires an equal effort on the part of the investigator of Scripture to *carefully exegete* the passages of mutual concern, clearly indicating possible variant interpretations. It is not enough for the exegete to present a perplexing array of opinions unless he shows to what extent they are within the possible meaning of the text.

5. Though Scripture is basically concerned with the theological, the spiritual, the moral, yet it is these basic concerns that guide the Christian philosopher and scientist and set the limits within which he operates and the presupposition on which he proceeds. So the Christian philosopher takes into account the supernatural God of the Bible. The Christian psychologist takes into account the doctrines of depravity and common grace, the conversion experience, and the work of the Holy Spirit. So, too, the Christian scientist cannot be a non-supernaturalistic type of evolutionist. He recognizes the fact of miracles. Science in turn may throw some light upon what God truly intended by the Bibles account of creation and the flood.

6. Inductive Biblical hermeneutics involves a cooperative enterprise. Truth is the goal. In it all the Christian knows that God's Word will be vindicated, the Book within which he finds the assurance of eternal salvation will be confirmed.

I conclude my remarks with a quotation from the stimulating sermon by Flint, "The Earth is the Lord's" (Psalm 24:1)[19], published in 1859 by the British Association for the Advancement of Science. In speaking of the general revelation of God in nature he says,

> Surely, this glorious universe was never made merely to satisfy the lower or animal wants of our souls—to fill us with food when hungry, with drink when thirsty. No; it speaks to everything that is highest and holiest in us. It should be approached with profoundest reverence. It will do little for us before we come to Christ; but there is no overrating what it will do for us after we have come to Christ.

Surely a Christian view of nature enhanced with scientific truth as well as artistic insight elevates and perfects created natural reality.

FOOTNOTES

1. A cooperative symposium published by Van Kampen Press, 2nd edition, 1950. The A.S.A. Monograph Number One, *Christian Theism and the Empirical Sciences* by Cornelius Jaarsma (1947), lays stress upon three interrelated basic factors for a Christian life and world view: (1) the fact of a sovereign, personal God, (2) the fact of creation, and (3) the fact that God is Self-revealing.

2. *The Scientific Papers of James Clark Maxwell,* Cambridge University Press, 1890, I, "On Faraday's Lines of Force," pp. 156-7, quoted by Ernest Nagel, "Symbolism and Science," pp. 69-70 in *Symbolism and Values: An Initial Study,* Thirteenth Symposium of the Conference on Science, Philosophy and Religion, Harper, 1954.

3. William C. Dampier *A History of Science and Its Relations with Philosophy and Religion,* Cambridge University Press, 1943, p. 485.

4. "The Methodology of Christian Evidences," *The Calvin Forum,* May, June and August, 1954.

5. Cf. Kurt Lewin, "Cassirer's Philosophy of Science and the Social Sciences," *The Philosophy of Ernst Cassirer,* ed. Schilpp, Library of Living Philosophers, 1949.

6. Helen L. Whiteway does this in *Scientific Method and the Conditions of Social Intelligence,* Trade Printers, St. John's, Newfoundland, 1943. She follows Overstreet's *Enduring Quest,* Norton, 1931, in an effort to deal with the "fulness" of evolved reality. She is right in maintaining that experience is broader than knowledge, but does not adequately support her suggestion that esthetics may offer a "potent source for the method of social intelligence."

7. *International Encyclopedia of Unified Science,* Vol. I, No. 5, 1938, University of Chicago Press, p. 1. Lenzen restricts his attention to "things and phenomena experienced in observation." His word "prehistoric" I would take to mean pre-written documents, i.e. pre-3000 B.C.

8. *Reason and Nature, an Essay on the Meaning of Scientific Method,* Harcourt, Brace & Co., 1931, p. 77.

9. Cf. Lenzen, op. cit., p. 26. "A Geiger counter is a tube in which a momentary current flows when a particle of sufficient energy passes through and produces ionization. The momentary current is amplified and actuates a mechanical counter which registers the number of particles that pass through the tube."

10. Lewis, now retired from Drew Seminary, Madison, New Jersey, might be called a "conservative" neo-liberal. See his sixty theological articles in the *Harper's Bible Dictionary* (1952), especially those on "Revelation" and "Inspiration." Lewis operates under a continuous tension between criticism of and respect for the Bible. He rejects the virgin birth, eternal punishment, the Biblical account of the origin of evil. With characteristic ambiguity he doubts the language of miracles and the resurrection while accepting them as events. See his *The Biblical Faith and Christian Freedom,* Westminster, 1954.

11. The reader is referred to the classic, scholarly study by B. B. Warfield, *The Authority and Inspiration of Scripture,* Oxford, and to the helpful symposium, *The Infallible Word,* ed. Stonehouse and Wooley, Eerdmens.

12. Ed. M.S. and J. L. Miller, 1952, pp. 31-33.

13. In the *New Bible Commentary,* ed. Davidson (Eerdmans', 1954), Andrew McNab (Superintendent of the Shankhill Road Mission, Belfast) says concerning II Peter 1:19-21: "Here Peter declares that holy men of God were borne along by the Holy Spirit as a vessel is borne along by the wind. This does not involve any conclusion that they were unconscious instruments or mere machines; but it does most emphatically involve a control and a 'carrying' power which are quite beyond anything that the human will or imagination can claim for itself. Here is a basis not only for the doctrine of the inspiration of the Scriptures but also for the doctrine of the entire trustworthiness or 'infallibility' thereof." This is a healthy corrective to the introductory chapter on this topic.

14. Donald Macmillen, *The Life of Robert Flint,* Hodder and Stoughton, London, 1914, p. 294. See Flint's *Christ's Kingdom upon Earth,* Blackwood, London, 1865, pp. 164-5, 302f.

15. *Systematic Theology,* Vol. I, p. 114, and pp. 106, 183-4.

16. Op. cit., p. 10.

17. *Essentials of Physical Science,* Eerdmans, 1954, p. 30.

18. Eerdman's, 1954.

19. *Christ's Kingdom Upon Earth,* p. 10.

A Sound Protestant Hermeneutic Faces The Facts Of Science

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One of the most interesting facts of the mid-twentieth century, theologically speaking, is the interest in Hermeneutics or interpretation. This interest is not confined to one group or kind of theological outlook. All groups profess in theory a real interest in the principles of how to interpret the Bible. In most groups the interest is more than theoretical. Theory has been implemented by action.

Interpretation has been basic in neo-orthodox thinking. Take for example the ecumenical study conferences held by the World Council of Churches when it was in the process of formation back in 1946-47. These conferences were held when a bombed, ruined, devastated Europe was just crawling out of the ashes of world war II.

A conference was held in London August 10-12th. 1946. The mimeographed report[1] of this conference lists 24 delegates by name. They came from the continent, Great Britain and America (only five were from the United States). The agenda for the conferences consisted in papers which were read and then discussions over the crucial topics. These discussions centered around such topics as: "The Authority of the Bible," "The Interpretation of the Bible," "Old and New Testament; Law and Gospel", and "The Bible and Political Questions."

About six months later another conference was held in Bossey, a Swiss town near Geneva, from January 5-10, 1947. The mimeographed report of this conference lists 28 delegates by name (only one was from the United States). Papers were read by such men as Karl Barth (Basel, Evangelical Reformed Church), A. Nygren (Lund, Swedish Lutheran Church), L. Aalen (Aker near Oslo, Norwegian Lutheran Church), N. H. Se (Gentofte, Copenhagen, of the Danish Evangelical Lutheran Church), C. van Niftrik (Zeist, Netherland Reformed Church), B. Nagy (Sarospatak, Reformed Church in Hungary), W. Eichrodt (Basel, Evangelical Reformed Church), and H. Van Oyen (Groningen, Netherland Reformed Church). Following the papers there were discussions on the crucial issues. The report of the conference said that it "reviewed the London problems and pushed on to discover if possible some definite hermeneutical principles by which to pass from the Bible's message to the social, political questions of today."[2]

Interpretation is basic in orthodox thinking. Both in theory and in practice as orthodox people, we profess allegiance to sound principles of interpretation. But it is our practice that testifies to the true quality of our profession.

Only by an interaction of minds with a dependence on the Holy Spirit for wisdom can we arrive at a sound interpretation of any particular passage. This very conference here at Winona Lake is a most helpful sign. Here we are testifying to the world that orthodox people believe in weighing and evaluating issues. Let the world see us as we are—not as we are

imagined to be by our critics. We want to examine the evidence.

Only by a mutual trust in the integrity of each other can we make progress in interpretation. To impugn the motives of another or to hurl epithets is the surest way to breed distrust and chaos. To bind our hearts together in Christian love coupled with good sound thinking will produce confidence and greater clarity.

The application of a sound protestant Hermeneutical system to the Bible is indispensable for an adequate treatment of Science by informed Christians.

Hermeneutics Must Be Regarded as a Rigorous Discipline

If one is following a valid system and procedure of interpretation, he will not find that the system will accommodate itself to his emotional prejudices or predilections. Rather an honest interpreter must admit that his hermeneutical system is better than he is. In practice he does not measure up to its demands.

Definition of the Term

The Greek word *hermeneuo* means "to interpret, explain, expound."[3] A compound of this word is found in Luke 24:27. Bauer gives to it the meanings *auslegen* (to explain, expound), and *erklaren*/to explain, to interpret/[4] The English word "hermeneutics" designates the methodology and procedure for interpreting the Bible. Hence the current meaning of the word "hermeneutics" is true to its etymological meaning.

The oft-quoted comparison is still helpful to make clear just what Hermeneutics is all about. Hermeneutics is the science of interpretation just as homiletics is the science of preaching. In Homiletics one finds out the rules and procedures for preaching; in Hermeneutics one finds out the rules and procedures for interpreting. Hence preaching is the practical use of Homiletics and exegesis is the practical use of Hermeneutics.

Derivation of the Rules

Often the student of Hermeneutics asks about the source of the rules. Does everyone make his own rules so that his own particular theological likes and dislikes will be shown to be correct and incorrect? The answer is emphatically, no.

Roman Catholics derive their rules and interpretation from authoritative witnesses or proclamations. Protestants on the other hand have always rejected the appeal to the official pronouncement of Popes, of councils or the so-called unanimous decision of the fathers. Such standards have resulted in *eisegesis* (the reading of a meaning into a text) being accorded the status of legitimacy.

Protestants should derive their rules from the purpose of Hermeneutics itself. This purpose is to find out the meaning any statement[5] in the Bible had for those who originally read or heard it and what meaning it has for subsequent readers. Hence the rules which best accomplish this purpose are the most valid.

Essential Components of a Sound Protestant Hermeneutical System Should be Thoroughly Understood

Before one tackles the proposition as to how he thinks a sound protestant hermeneutical system should face the facts of science he should summarize the contents of Hermeneutics. These components that comprise the discipline can only be enumerated. Such an enumeration testifies to the fact that Hermeneutics demands the utmost of anyone's intellectual capacity and skill.

General Hermeneutics

This is the first of the two main divisions of Hermeneutics. General Hermeneutics consists of procedures and principles of biblical interpretation that apply to all of the various kinds of material in the Bible. No matter where one reads and seeks to unfold the meaning, these principles will be useful. However, some will be more important in one place than in another.

Content.—This is almost axiomatic. In order to be a good interpreter of the Bible one needs to know its entire content and message.

It is by reading the contents of the Bible that one comes to see the supernatural framework which is inherent therein. Many intelligent laymen who had never attended a college or university rejected liberalism. They sensed that in attitude liberalism was opposed to the biblical framework of thought. An unbiased reading of the text causes one to see the vertical-horizontal perspective that overshadows this or that detail, event, or statement.

It is by reading the contents of the Bible that one comes to know the particular emphases of the Judeo-Christian faith: man's estrangement from God and the corrupting influence of sin; the manner and ground of man's approach to God must be determined by God not man; man's need of a mediator; and that salvation begins here and is completed in the presence of God.

Context.—This aspect of Hermeneutics is more particular than the first. It consists in looking at what is said before and after the verse or statement to be interpreted. Usually only the immediate context should be studied. However, sometimes the larger and more remote context must be considered.

Grammar of the biblical languages.—To have a sound protestant hermeneutical system one must make the original languages the foundation upon which all interpretation rests. These languages are three in number: (1) Hebrew, a Semitic language which is the original of most of the Old Testament; (2) Aramaic, a Semitic language in use before and after Hebrew, which is employed in the letters of Ezra and half of the book of Daniel (2:4b-7:28); (3) Greek, an Indo-European language which is the original of the New

Testament and was the medium of communication of Hellenistic culture.

A mastery of lexicography and syntax is vital to good interpretation. Lexicography is concerned with the meaning of words. Hence the better the lexicon the better the interpreter will be. But this does not mean that lexicography is merely mechanical. It is far more than simply turning to an entry in a lexicon. The editor of the lexicon may list the passage in which the word is found under one meaning, but the context may incline you to favor one of the other meanings of the word. There is no such thing as push button lexicography! Incidentally, the habits of life and thought that belong to the Semitic mind make Hebrew and Aramaic ideal for word pictures. Syntax is concerned with the relationship between words, phrases, and clauses. There is far more syntax in Hebrew and Aramaic than the first year student imagines! Nevertheless, Greek of course is pregnant with possibilities syntactically and certainly ranks first when it comes to syntax.

History.—The historical background involves the national and individual surroundings of the people to whom God discloses himself. In the incarnation God's eternal son came unto his own people and they received him not. These divine self-disclosures were to the biblical writers historic experiences of paramount importance. Furthermore, the one who narrates these experiences writes in terms of his surroundings. The surroundings themselves enter into the disclosures. Archaeology and Anthropology are very helpful in making it possible to formulate a true and accurate picture of this cultural milieu.

Special Hermeneutics

This is the second of the two main divisions of Hermeneutics. Special Hermeneutics consists in the procedures and principles of biblical interpretation to be followed in order to secure a clear understanding of the specific kinds of material to be found in the Bible. These kinds of material are distinguished either by content or form, or both.

Figurative language.—This is one of the crucial areas of special Hermeneutics. A number of treatises could be devoted to this theme by orthodox scholars.

Just to give a list of the number of figures shows the complexity of the subject. If you were reading a passage of Scripture, could you identify: metonymy, synecdoche, personification, apostrophe, hyperbole, irony, fable, riddle, simile, metaphor, parable, allegory, typology, symbols and symbolic actions?

It is obvious that prior to identification one must know all the technical forms that figurative language and behavior may assume. Then after identification one must go on to show its meaning and significance. Before a housewife prepares fish for the table she ascertains what kind of fish she is going to fry, bake, broil etc. If she were to go to the store and merely ask for some fish the clerk would reply: "What kind?" Were she then to continue to say: "Give me some fish", the clerk would have good reason for regarding her as a simpleton. Yet there are some who in biblical interpretation keep saying: "This is figurative language" without bothering in the least to show in what category it belongs.

Figures of speech are not usually subtle. If there is no clear reason for the language to be figurative, if there is no technical form to which the expression or section under consideration corresponds, one should regard it as literal. Hence one assumes a statement to be literal unless he can make a rational case to show why it cannot be literal and why it should be figurative.

Figures of speech are also one of the most effective ways of saying a thing forcefully. Hence in explaining a figure one should show just how forceful the expression is and why it is employed. Figurative language is a normal part of daily conversation. If I say: "He is a queer bird," it is much more effective than to say: "He has idiosyncrasies and peculiarities that render him incapable of fraternization." The metaphor is obviously much more effective than the abstract language.

Prophecy.—Here is another crucial area of special Hermeneutics. Every student of prophecy should ask himself as to what basis and upon what principles he goes about to interpret it . He should not be content with the reply: "My principles are satisfactory." He should take heed that they are the best, lest in this area that captures the popular mind he leads many astray.

Doctrine.—Special Hermeneuatics touches upon the principles and procedures for the interpretation of doctrinal materials. For example: how are proof texts for any particular doctrine to be handled? This is an important question. Adding a series of texts together in the wrong way is the first step to heresy.

Devotion and conduct.—The amount of material in the Bible devoted to the practical lives of those who believe in God is quite extensive. Christians are to scrutinize and control their emotions, affections, and habits of life. How important then it is for the interpreter to rightly construe these admonitions and instructions. This is just another of the categories under Special Hermeneutics.

Poetry.—The subject matter of poetry is quite varied. Poetry may be doctrinal, devotional, historical, or practical. But in each instance the question to be considered is: does the poetic format contribute in any way to the meaning? How should one treat this kind of creative thought? Special Hermeneutics can assist the interpreter when he finds himself confronted with thought expressed through the vehicle of poetry.

Procedures of the Interpreter of Scripture in Putting the Facts and Explanations of Science to Use

Now that it is clear what is involved in a sound protestant hermeneutical system, it will be evident that the approach to science will only be an outgrowth

of what one does in the other aspects of his Hermeneutics. Here are the procedures that this interpreter considers important.

The Principle of Interdependence

Recognize the principle of interdependence to be a real necessity among biblical scholars and scientific investigators. There can only be interdependence if both men are working in an area where they can know something. Hence there is a basic assumption that man can have true and valid knowledge both in the area of nature and in the area of the being of God and His relationship to men. We have sure knowledge but not all or complete knowledge of God. We know only as much as He has disclosed. We have sure but not final knowledge of nature. We know only as much as man's present investigations have certified.

For interdependence to accomplish all that it should the Christian public at large should be made conscious of a working liaison between Christians who are biblical scholars and Christians who are scientific investigators. The biblical scholar is not acquainted with the data of atomic fission nor is the scientific investigator acquainted with the grammatical phenomena of the biblical languages. But the interchange of ideas between the atom scientist and the biblical linguist will establish the confidence of both in the activities of the other.

A Supernatural Framework

Recognize a supernatural framework for all the data of the Scriptures and of Science. As orthodox thinkers we distinguish ourselves from the neo-orthodox by insisting upon a consistent supernatural framework. We do not believe that anyone can have a "great theology" concurrent with the belief that Yahweh was a tribal god which Israel picked up in the wilderness when a few migrants struggled through the desert from Egypt to Palestine.

The same consistent supernaturalism should operate in science. If one believes that God creates progressively, he must stress that it is the God of the Scriptures who is doing this creating. Philosophers have a lot to say about God. But the basic question is still there: What God?

Nature of the Language Employed

Recognize that the Scriptures employ the language of men to tell us about the activity and nature of God. Of course it is clear that Science belongs in the realm of the activity of God. This phrase "the language of men" should be clarified briefly.

It is the language of appearance in dealing with nature. In the Sermon on the Mount Jesus taught that God causes his sun to rise upon evil people and good people (Mt. 5:45). It is self evident that this is what appears to happen.

It is the language of ultimate not intermediate cause in dealing with nature. In the very same verse cited above (Mt. 5:45) Jesus says that God causes it to rain upon just ones and unjust ones. He didn't say that God sends a low pressure area with the barometer standing at a certain level, the wind velocity out of the northwest, and an increasing humidity to the point of saturation. God did this but Jesus doesn't mention it.

It is a language which discloses the culture of the people who spoke it. Ramm rightly contends that the vocabulary for time, the psychological terms, the medical language, the mathematics and measuring systems, and the geographical terms are taken right out of the *sitz im leben.*[6] The fact that these terms come from a bygone epoch does not keep us from understanding the meaning if we convert them into our modern equivalents. For example Luke tells us that two followers of Jesus were traveling to Emmaus. He locates the town as 60 *stadia* from Jerusalem. That means nothing to the reader. The rendering 60 furlongs in King James and A.S.V. is just as meaningless. But if one knows that a *stadion* equals 606 and ¾th feet, he can figure out that this distance is almost 7 miles. For a German it would be 192 meters.

Consideration of all Relevant Biblical Factors

Determine all of the biblical elements or factors which have *real* bearing upon any fact or explanation of science. General Hermeneutics (Content, context, grammar, and history) and Special Hermeneutics in some cases will set up specific limitations for scientific hypotheses. These limitations will not be seen by just a few people but they will be evident to the majority of the scholars who examine the evidence. Often, however, the only limitation is that of a supernatural framework for the scientific theory. The difference between a *real* limitation and an *imagined* one has been unfortunately the source of conflict throughout the centuries. Scholars should exert great care to avoid this pitfall. On this score the popular saying is so applicable: "It's easier said than done!"

Impact of Science on Christian Concept of God

Emphasize how scientific discoveries reveal the greatness of the God of the Bible who has disclosed Himself as a unique being in the Scriptures. The man who accepts chance as the cause of all the complex order of nature is loyal to an irrationalism that satisfies no one. After looking at the greatness of the universe as modern astronomy and physics have staggered our imagination, the Christian should stop to worship and he should sing the doxology more fervently.

Impact of Redemption on the World of Nature

Emphasize how the biblical concept of the redemptive acts of God provides the only satisfactory answer to the the question: how is it that one finds both intricate design and perplexing derangement in the world in which he lives. In Paul's great classic on this subject in Romans 8:19-22 he pictures nature as subjected to vanity by God himself. In its present state

nature is spoken of as groaning and travailing. Paul even goes so far as to characterize the state of nature as "the bondage of corruption" (Romans 8:21). Yet there is a sequel. There is an outcome. Nature too will be set free when God's sons are revealed in all their glory. The Christian philosophy of history envisions harmony on every level: between God and man, between God and nature, and between man and nature. A sound protestant hermeneutical system faces the facts of science by analyzing both the facts and the biblical statements. From this analysis it provides the materials for both the biblical scholar and the scientific investigator to see more clearly the total dimension of God's action both in redemption and nature. The picture thus derived is an awe inspiring one indeed.

How fitting to exclaim: "O the depth of the riches both of the wisdom and knowledge of God! how unsearchable are his judgments, and his ways past tracing out! . . . For of him, and through him, and unto him are all things. To Him be the glory forever. Amen."

FOOTNOTES

1. *From the Bible to the Modern World,* Report of two Ecumenical Study Conferences on the "Biblical Authority for the Church's Social and Political Message Today," The Study Department of the World Council of Churches, (Geneva, Switzerland, 1947).
2. *Ibid.,* p. 3.
3. Henry George Liddell and Robert Scott, *A Greek-English Lexicon,* revised and augmented throughout by Henry S. Jones and Roderick McKenzie (9th edition; Oxford: At the Clarendon Press, 1925-40), I, 690.
4. D. Walter Bauer, *Griechisch-Deutsches Worterbuch* zu den Schriften des Neuen Testaments und der ubrigen urchristlichen Literatur (Dritte auflage; Berlin; Verlag Alfred Topelmann, 1937), p. 322.
5. Under "statement" is included exclamation, exhortation, question, etc.
6. Bernard Ramm, *The Christian View of Science and Scripture* (Grand Rapids: Wm. B. Eerdmans, 1954), pp. 70-76.

A Physical Scientist Defines the Scientific Method

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I. Definition

If all the scientists present would write out their definition of Science it is quite probable that no two of them would be the same. The difference would most likely not only be a matter of words used, but we could expect a wide divergence in the scope of knowledge included in such definitions. It is certainly facetious for any one person to present a definition of science that is intended to represent the opinions of all scientists. To a lesser extent a similar problem is encountered in defining Physical Science as a more limited field of science. For that reason the boundaries of that area of science as presented here may be considered arbitrary.

Let us for the present limit our discussion of method to what is sometimes called the inorganic natural sciences. This would include physics, chemistry, astronomy, geology and certain parts of biology. It would exclude psychology, sociology, economics and certain parts of biology.

Futhermore let us consider only what is often termed non-formal science. That is we will consider only methods used to ascertain whether or not certain things are in actuality true. In other words we are talking about the methods which are commonly used by scientists to carefully investigate natural phenomena to determine what exists and the relationships and functions of that existence. The phenomena under investigation may have some immediate practical value or it may be fundamental information, the value of which is not currently apparent.

II. There is not ONE Scientific Method.

Science teachers have for years been talking about *the* Scientific Method. Certainly a good many people have the concept that there is a certain cut and dried pattern which is always followed in scientific investigations![1] The Harvard school[2] has recently taken exception to this point of view and I believe rightly so. If one takes the neat outline of *the* Scientific Method and tries to see how many of the monumental discoveries of science in the last hundred years fit it, he is in for a surprise. There is not just one rigid scientific method, but many methods which are valid and can be used to determine scientific truth.

This does not imply, however, that any slip-shod method can be used to determine physical science truth. Mavor[3] suggests a fundamental principle when he says that the difference between science and common

knowledge is in precision of observation and reasoning. In a general way we can say that science always uses the empirical method to determine truth. That is we rely on information received through one or more of our five senses as our fundamental source of truth.

Science however takes cognizance of certain limitations in the use of the senses to determine truth. Churchman[4] suggests three such limitations. In the first place only controlled experiments are of value in determining truth. Optical illusions are familiar to us all. In uncontrolled experiments the other senses also play tricks on us at times. Secondly, in using our senses we assume certain things to be true and then either prove or disprove them by the consistency of the results. For example we assume that the mechanism of the speedometer in an automobile can register the speed of the car. We may make repeated, carefully controlled experiments to determine if this is so. In these tests we assume that our measuring devices and timing devices are accurate. If we find that at different speeds and conditions we consistently get comparable results we may conclude that the speedometer, the measuring equipment, and the timing apparatus are suitable equipment to help us make certain observations with our senses. Likewise we assume the validity of more abstract entities, and accept this validity because of the consistent results obtained. The third limitation, which incidentally was originally proposed by David Hume is that no Law of Science can ever be reached that is entirely free from doubt. While all available evidence may point to a certain conclusion there is always the possibility that some later evidence may negate that conclusion. The methods of science will give the answer that is most probably true, but they will not remove the possibility that the particular answer may not be true. This is part of the background for the "statistical renaissance" that has in recent years changed the procedures of investigation in many fields of science. The importance of this will be clear, I am sure, after Dr. Dilworth's discussion.

At the same time that the scientist insists on the empirical method for ascertaining truth he makes use of scientific literature. Many, in fact probably most, of the facts of science with which a scientist is acquainted have not been verified by his own senses. Inherent in this system of reporting and using scientific data is the principle of absolute integrity. Scientists use less than perfect equipment and are subject to human errors in observation, but it is a basic part of the method of science that the scientist reports only what he observes, and all that he observes with regard to a particular phenomenon, and that he attempts to determine the probable range of error to which his observations are subject. The effect of these observations on a particular theory or concept which he wishes to establish or disprove is inconsequental to his reporting of his observations. Furthermore the scientist needs to clearly distinguish between data and his conclusions based on that data. There are of course unethical scientists and some notable examples of frauds could be cited, but controlled experiments are usually subject to re-investigation and it is in this process or repeated study by different investigators that science has been able to maintain its integrity.

With this understanding of the principles that control the methods that may be used by scientists, it is not out of place to look at one specific method of science that is frequently outlined to students of science. This is not the only method of science, but it is one valid method. The steps are often given as Hypothesis, Theory and Law. First one forms an hypothesis. This is an explanation of some phenomena that the experimentor assumes on the basis of previous experiences of himself and others to be correct. For example there are at present many hypotheses concerning what causes a particular type of cancer. There is no set way in which one can come to hold a certain hypothesis. The genius of the man, his training, and certain accidental and often incidental factors combine to suggest it. It is in this sense that one can say that there is no one scientific method. However there is one specific thing to do with an hypothesis. That is to test it. If this hypothesis is true certain observable phenomena should result. The laboratory is a place to design and carry out experiments to see if the expected results follow. If they do not—guess again. i.e., try a new hypothesis. One is free to speculate. If the hypothesis is confirmed it is often then called a theory. If it is confirmed by a large number of investigators under a variety of conditions, and following various deductions based on the hypothesis, and over a considerable period of time, it may then be called a law. However the distinction between a theory and law is one of degree and there is no definite boundary between the two.

One might generalize a bit on what some have observed to be a variation in usual procedure between American and British research concerning this method. The American is more likely to proceed, without distracting side investigations, to prove or disprove his hypothesis. The Englishman is more inclined to follow any or every lead that comes along. As a result Americans may more quickly come to specific desired results, but the English will probably uncover more fundamental information. The Englishman who discovered penicillin[5] did so because he was curious about a certain result quite incidental to the main purpose of the experiments he had underway. Certain Americans[6] observed the same phenomena under similar circumstances, but did not take time to investigate them.

III. Scientific Language Conveys Unique Meanings

For one who is not a participant in scientific investigation to appreciate the methods of the scientists, it is necessary to recognize the unique way in which the English language is utilized by the scientist. Many

very common words are adapted by scientists to convey very specialized meanings. To one who constantly uses these words in this particular sense, the specialized meaning becomes so familiar that he frequently fails to remember that the non-scientist will not get the same concept when these words are used to explain his discoveries. It is in this problem of communication that many of the misunderstandings between scientists and theologians have arisen, it seems to me.

Toulmin[7] makes this point quite graphically by a consideration of the meaning of the scientific discovery that "light travels in straight lines." The two main words in this statement, "light" and "travels" both have different meanings in this statement from what they would have had to the average person in the day that this discovery was announced. Prior to that time "light" meant a lantern or perhaps a light spot made from the sun shining through the clouds. The simple statement of this discovery did not convey the idea of photons to the non-scientist. Like-wise the word "travel" did not convey the concept of motion of photons. It might have meant to the average person that light patches made by the sun shining through the clouds move across the ground in straight lines. Even now if I were to say, "look at that light moving outside" probably none of you would think about the motion of photons (which you couldn't observe) but you would look for a light source in motion. So it is with most scientific discoveries, they represent a new concept that is described with old words with new meanings.

It is in this context of misunderstanding of scientific concepts that some of the theologians of the past have felt that certain theories of science were contradictory to certain Scriptural teachings. Conversely as Ramm[8] points out it has been in the allegation of these unique scientific meanings to language of the Scripture that many false conflicts have appeared.

IV. Summary

It is impossible in a limited paper such as this to give a comprehensive discussion of the method of physical science. There are several important ideas however, that I trust have been communicated.

1. There is not *one* simple method that is universally used by physical scientists, or by scientists in a broader sense.

2. There are certain features connected with most scientific work that distinguish it from common sense reasoning. Some of these are: speculative thinking; deductive reasoning; deliberate, carefully controlled and repeated experimentation; and accurate recording and reporting of experimentation in language which is exact and unique in its meaning.

FOOTNOTES

1. e.g. Karl Pearson.
2. James B. Conant, *Science and Common Sense,* Yale University press, 1951, chapter III.
3. James W. Mavor, *General Biology,* The Macmillian Co., New York, 1941, p3.
4. G. W. Churchman, *Elements of Logic and Formal Science,* J. B. Lippincott Co., Philadelphia, 1940, p151ff.
5. Elexander Fleming, 1929.
6. e.g. Wm. A. Mosher.
7. Stephen Toulmin, *The Philosophy of Science,* Hutchinson's Universal Library, London, 1953, Chapter II.
8. Bernard Ramm, *The Christian View of Science and Scripture,* Wm. B. Eerdman Publishing Co., Grand Rapids, Mich., 1954, Chapter III.

The Scientific Method As Viewed By A Historian

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Any historian who comments on the Scientific Method finds himself in a quandry because he is obliged to chronicle the development of the method using techniques and assumptions derived from the method. He is subject to errors similar to those committed by a drunkard describing the effects of alcohol. Understandably the ideal of detachment is difficult for a historian to achieve. This predicament, however, is not that of the historian alone but is shared by all scientists and social scientists who include in their discipline any developmental concept. In fact, because the historian attempts to achieve the perspective of totality, he may be in a better position than most scholars to understand the many applications of the Scientific Method and to detect its limitations and misapplications.

Perhaps the greatest contribution of the historian to the understanding of the Scientific Method has been the recognition that it is applicable only under certain circumstances and then only to particular kinds of subject matter. At least two other methods, the historian feels, are necessary for an understanding of the universe . . . the Historical Method and, what might be called, the Method of Faith, although not necessarily of the religious variety. Each method is operative in its own sphere.

The Scientific Method, for instance, is applicable in the sphere of the natural world . . . the world of insensible matter, of plant life, of animal life. This sphere even includes those elements of man which are not controlled by his thinking processes. In this natural world it is assumed that there are uniform, universal, and timeless "natural" laws which can be

discovered and made comprehensible by the Scientific Method. In general, the historian's only concern in this sphere is in describing man's efforts to master it.

The second of the three spheres is that of Mankind . . . the world which is the conscious product of the thoughts and actions of man exercising what he choses to call "freedom". In this sphere all present ideas and events are built on the past but each experience is unique, each occurs but once in time, each has its own particular setting, and each is self-consciously a human product. This world of mankind, in contrast with the world of nature, is one of tendencies, not of laws; of evidences, not of facts; of discernment, not of discovery. Although it is customary to call the modern study of mankind "scientific", the methods are in reality those of the Historical Method which relies on description, judgment, and synthesis rather than on the mathematically controlled techniques of the physicists.

The third of the three spheres is transcendent, apart from both the human and the natural world. It is concerned with purpose and meaning in a sphere where evidence can be neither physical nor human. Such questions as: "How and why do the laws of nature exist?" and "Why do certain tendencies develop in human society" are generally beyond the competence of both the Scientific and Historical methods. Nevertheless, scientists and historians delight in positing answers to such questions without explaining that their methods . . . by definition . . . exclude fundamental consideration of such questions and that they have, in fact, invaded the field of metaphysics. Any answers to such questions as these are essentially the products of faith . . . whether in God or in the growing perfection of mankind through the exercise of human ability or in the eventual self-destruction of nature. H. G. Wells as well as Augustine was a man of faith.

The compartmentalized study of these three spheres using the method in each which is particularly applicable, is even now only imperfectly achieved. This confusion is not only widespread but ancient. Certainly the typical medieval peasant considered the vagaries of the weather, the weeds in his crops, and the foul disposition of his reeve, phases of a single, divine operation. (It should be recognized that medieval theologians seldom committed the same error.) Kepler and Brache, so renowned as the fathers of scientific astronomy, were also enthusiastic astrologers who traced their own destinies and those of mankind in the heavens. In our own day Communist Russia has attempted to force the principle of heredity, the social behavior of human beings, and the negation of all religion into a single, naturalistic faith deduced from Marx.

Unfortunately, not only Communist but Western society has been similarly guilty of confounding systematic study. There are today frequent demands that the scientists who have found the means of releasing and utilizing atomic energy should, by the same Scientific Method, control its use . . . as if the Scientific Method were a device applicable in human affairs and a device for social control. In fact, such a misunderstanding of the Scientific Method and of its primary applicability in the sphere of nature led Auguste Comte more than a century ago to devise a philosophical system now known as Positivism which preached that a perfect world with a perfect society could be developed through the consistent application of the Scientific Method or, as it was then known, as the Newtonian method. By definition Comte and his multitude of modern but unconscious disciples have reduced all human activity to the status of natural phenomena . . . whether marriage or thought or the marketing of produce.

Such a misapplication of the Scientific Method (and such a neglect of the role of the Historical Method and of Faith) is possible only because most people have failed to understand what it is and to recognize that, as it has been refined by the physical scientists, at least, it is a precise method with a limited scope.

In its broadest definition the Scientific Method is a procedure by which the laws of nature can be discovered. (By such a definition rather than by proof the Scientific Method eliminates from its concern miracles or God.) It is applicable only to a subject matter which can be measured and stated in a numerical relationship. (Conversely, it does not apply to any matter which is subject to the reasoned or unreasoned whim of man.) It assumes that any phenomenon it studies is universal, having no relationship to historical time or space. (At this conference Dr. Allan A. MacRae has made a very lucid and logical objection to this fundamental assumption of the Scientific Method as being not only beyond proof but, when applied outside historically present time, as being highly suspect.) In its modern form the Scientific Method relies heavily on deductive thought (as well as inductive thought) on at least three levels: the framing of any original hypothesis; the defining of the factors which are considered relevant to proving or disproving the hypotheses of other investigations and other investigators. (We might say here, rather candidly, that pure empirical science which all too often is taught as the Scientific Method died where it began, with Francis Bacon.) The Scientific Method makes use of carefully controlled experimentation in which the scientist manipulates his subject matter in such a way that the experimental situation differs in only one particular from the control situation. And finally, because of logical limitations, even with the most careful technique, the conclusions of the Scientific Method are never more than probabilities. In fact, most frequently its results are stated only as working hypotheses or theories. Even when they are stated as laws, they are not considered as immutable as any generation which

has been conscious of Einstein or atomic fission must know. (The Scientific Method in the hands of its masters never claim to lead to the Truth.)

Some of you respond that if these are the conditions of the Scientific Method, many fields which claim to be scientific fail to meet the minimum conditions. This is certainly true. In common usage "scientific" has ceased to refer to a self-validating methodological procedure and, all too often, refers to no more than an honest examination of a particular problem using any techniques at all. We must either admit that there are many different "scientific" methods, many of which have dubious reliability, or that in some fields the Scientific Method is most imperfectly and improperly applied. Even the field of the life sciences (zoology, bontany, etc.) which is customarily called scientific claims the right not because of adherence to the tightly conceived Scientific Method but because, in accord with the classical concept of science, descriptive data is brought together in an encyclopedic compendium. Classification and not the isolation of phenomena, numerical analysis, and controlled experimentation have been the foundation of the life sciences. Similarly, in such a field as geology, the modern Scientific Method is generally inapplicable and the techniques which are called "scientific" owe far more to the Historical Method than to that of the physicists.

The Scientific Method when it has been applied where it is applicable has opened broad new areas to human knowledge and human control. When it has been misapplied or applied in analogy, as it often has been in the second of the three spheres of study I mentioned, the sphere of mankind, it has frequently given false ground for confirming prejudices and ignorance. In our own experience most of us can recite a long list of once-designated "scientific" theories which are now discredited because they failed to meet the procedural conditions of the Scientific Method. Lombroso, the father of criminology, was certain that the shape of the skull and the construction of the face determined criminal behavior. Locke and Hobbes developed scientific theories of government . . . which supported conflicting systems. Adam Smith, who thought he had detected the fundamental law of human nature, balanced upon it an entire system of economics. Marx, who seemed blind to the methodological weaknesses of his predecessors, brazenly called his deductive and determinist system "scientific." (Motesquieu's historical realism has always been refreshing to me because he recognized that mankind is understandably only when it is studied in a social situation by the historical method.)

In more recent times the systematic study of Mankind (in distinction from the study of Nature) has been designated the Social Sciences. These include, generally, sociology, economics, political science, psyhology, cultural anthropology, and, though with dissent, history. These academic disciplines as they now exist have been strongly influenced by the ideas of Auguste Comte: that the theological and metaphysical represent past stages in the development of man; that Western man has now entered the scientific or positive era; that the same Scientific Method applies to all "sciences" from mathematics to sociology; and that this Scientific Method is not only the key to the knowledge of the universe but to its control. Although many of the details of the system devised by Comte were refuted during his generation, generalized Positivism is implicit in much that today calls itself Social Science. In many cases this implicit positivism has been reduced to two deductive hypotheses: an atheistic assumption that any consideration of God must be relegated to a past era and a naturalistic assumption that all human life can be, by scientific study, reduced to a series of invariable laws.

The original positivism of Comte was confirmed in its naturalism two generations later by the Social Darwinians who naturalized the humanistic idea of Progress suggested by Condorcet into a mechanical and deterministic one. With this hypothesis as a basis what was called science (although scarcely even akin to the Scientific Method) advocated a series of iconoclastic theories. Natural theology claimed to prove the evolution of religion from polytheism to monotheism. Government, it was claimed, had evolved from tribalism to its highest form in egalitarian democracy. Popular history stood waiting for supermen and super races. Psychology, after several false starts, reduced man's behavior to a totally naturalistic but optimistic state.

Even scholarly history adopted the title "scientific" but in a sense totally different from that of the Positivists and only slightly reminiscent of that of the physicists. In the Baconian spirit the "scientific historians" set out to collect all the facts . . . which would in theory speak for themselves. (No one recognized that facts in the sense that the word is used in science do not exist in history, that one is unique and the other universal, that one as discovered stands without meaning and the other exists only when it has meaning.) Such scientific history, which is usually associated with the great German historians who followed in the train of Leopold von Ranke, introduced new standards of objectivity and even today, with its shortcomings recognized, it remains the foundation on which is built all monographic historical study. Nevertheless, however objective the account and however close to the truth the conclusions may be, such history is not scientific in the sense that the physical scientist used the Scientific Method. (This should not imply, however, that the Scientific Method is any more capable of leading to the truth than the Historical Method or than Faith.) Conversely, the scientific historian uses a highly refined descriptive method which emphasizes: a careful delimitation of the problem in terms of time and space; a rigorous searching for all

accounts which are relevant to the defined problem; the testing of the validity of all sources by what is known as critical techniques; and, finally, the reconstruction of the events as they took place through the subjective wisdom of the historian.

The gloom that resulted from World War I pricked the rosy bubble of optimism of the Social Darwinians, in the Social Sciences the certainty of the Positivists was exchanged for the relativism of the Pragmatists; the historians became conscious that neither complete objectivity nor detachment was possible in any Social Science; and the scientists freely admitted that many scientific laws were neither invariable nor immutable and that what order does exist is beyond explanation by the Scientific Method. The door was set ajar awaiting the philosophers and theologians who were ready to say that neither the Scientific nor the Historical Method were adequate to give an understanding of the universe. It became popular for the scientists and the social scientists to profess belief in a supernatural force . . . but always one operative outside their particular discipline. After more than a century it became respectable and relevant to discuss the fundamental assumptions which lay beyond proof by either the Scientific or Historical methods.

This new admission did not modify the methods nor do more than cast slight doubt on their absolutism. In practice, however, it became customary to recognize that the natural world, the human world, and the transcendent world deserved autonomous study in spite of pleas for interdependence. It was recognized that there was no practical relationship between a belief in God and a study of the boiling point of liquid lead. A naturalistic faith in no way changed the objective data on the mating habits of howling monkeys. Humanistic faith could scarcely alter the method or conclusion of an investigation into the birth of Abraham Lincoln. Fragmented study of isolated phenomena did not lead naturally to a recognition of interdependence.

In fact, only when a total body of research was synthesized, only when it was fitted into a comprehensive philosophy by a Toynbee or a Huxley, did a particular faith system become apparent. Such speculative thought was, in fact, in a domain where few scientists or social scientists have shown great familiarity or brilliance and, all too often "confessions of faith" were succeeded by the most inadequate scholarly application.

The recognition of these changes is elaborated by a co-operative volume, *The Social Sciences in Historical Study*, published last year under the sponsorship of the Social Science Research Council which analyzed the considerable changes in attitudes which have taken place in the past ten years since a similar volume was published. The unobtainable ideal of absolute objectivity has been replaced by a relativism, a single "scientific" approach has been replaced by one for each discipline, and honorable subjectivism is recognized as inevitable if not desirable. The reasoned conclusion of the study was that a man should keep himself in step with the prevailing temper of thought, be it democratic or totalitarian, agnostic or Christian, socialist or capitalist, and exercise his objectivity, if it can be called that, from this perspective. Such a viewpoint was christened "Objective Relativism" and is probably as complete a disavowal of the popular concept of science as has proceeded from the social sciences.

For lack of time and relevance to my topic as given, but certainly not for any lack of importance, I have deliberately excluded any systematic discussion of the third sphere outlined at the beginning of the paper. Obviously, it is not one where the Scientific and Historical methods have been or, even with gross distortion, could be applied. However, the dependence of these methods on certain unproved assumptions justifiable only in the field of metaphysics and faith, is often overlooked. I have attempted to emphasize some of these assumptions as I have developed this paper because I feel, both as a Christian and a historian, that the limitations of the Scientific and Historical methods are not, primarily, methodological but philosophical and theological, if that term can be used today in a non-sectarian sense. It is unfortunate that, in the past, so much that called itself "Christian science" was either sheer negativism or pious ignorance rather than a grappling with the fundamental assumptions. (I find at this joint meeting of the ASA and the ETS an indication of a marked change in this regard and one which presages the achievement of respectability for Christian scholarship.) It is a shame on Christendom that many of the scholars who potentially are qualified to relate scientific and historical achievements to Christianity have been suborned into silence by heresy hunters. It is indicative, I believe, that some of the most creative scholars in the American Scientific Affiliation are men who are not associated with Church-related or religious institutions.

Given the opportunity I would have been stimulated by the opportunity to outline what I feel is a Christian interpretation of history and one which inter-relates the three spheres . . . nature, mankind, and faith . . . at the only level where I feel a true synthesis can be achieved. It should be obvious that my personal faith leaves no room for a synthesis of knowledge other than a Christian and basically a Calvinistic one. This task, I feel, is too large for one man. I feel that a truly Christian synthesis of human knowledge which places the Scientific Method in its proper arena, in the sphere of nature, which places the Historical Method in its proper arena, the sphere of mankind, cannot rely on the verbal formulations of the Fourth, the Thirteenth, the Sixteenth, or even of the Nineteenth centuries. The task is waiting to be done and must be done by scholars like yourselves.

The Role of Statistics in the Scientific Method

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The theory and methodology of statistics is a complex and technical subject. Thus in order to give a non-technical account it will be necessary to limit the discussion to only the most general aspects of the subject.

Now the scientific method consists in formulating a physical hypothesis and then testing the hypothesis by means of a physical experiment. The problem, then, is to determine when and how statistics enter into these procedures. Let us look more closely at the process of testing the hypothesis. It consists in carrying out the experiment and then interpreting the results. Furthermore, the interpretation involves making some decision concerning the hypothesis under consideration. But any physical experiment involves some kind of random error, even perhaps the human errors associated with reading the position of a pointer on a scale. For even the most accurate measuring device can only be read to a limited number of significant figures. Thus the decision concerning the hypothesis must take into account these chance effects. But chance effects can only be treated by means of the laws of probability and hence the decision concerning the hypothesis is indeed of a statistical nature. It will thus express a probability judgment. However it will not be a probability statement concerning the truth or falsity of the hypothesis. For probabilities are associated with events rather than statements. Let us examine, then, how the laws of probability can be used to gain information about the hypothesis from the results of the experiment.

For simplicity, let us suppose that there are only two possible alternatives in the physical situation we are contemplating and that the hypothesis asserts that under the conditions of the experiment a particular one of these alternatives must hold. We shall further assume, for the moment, that the laws which govern the chance effects are known. Then under the supposition that the hypothesis is true, namely, that a particular one of the alternatives holds, the probability that the observed outcome of the experiment would occur can be computed. This gives a number P_1 which is not less than zero and not greater than one. Similarly, under the supposition that the hypothesis is not true, namely, that the other alternative holds, the probability that the observed outcome of the experiment would occur can be computed giving a second number P_2. Clearly if P_1 is close to one while P_2 is close to zero, which means that the observed outcome of the experiment is likely to occur if the hypothesis is true but is unlikely to occur if the hypothesis is false, we would be inclined to conclude that the experiment supports the hypothesis. On the other hand, if P_1 is close to zero while P_2 is close to one, we would be inclined to conclude that the experiment supports the contrary hypothesis. Finally if P_1 and P_2 are nearly equal then we must conclude that the experiment is inconclusive as far as the hypothesis is concerned. In any case, however, the numbers P_1 and P_2 give numerical measures of the bearing of the experiment upon the hypothesis.

It should be noted that the traditional, non-statistical method of interpretation which accepted or rejected the hypothesis depending upon the outcome of the experiment represents a sort of limiting form of the above procedure. Namely, if the experiment is such that if the hypothesis is true, then almost surely the outcome of the experiment will give P_1 very close to one and P_2 very close to zero, while if the hypothesis is not true, then the outcome will almost surely give P_1 very close to zero and P_2 very close to one, the traditional method of interpretation does indeed agree with the one outlined above. In the more exact sciences (physics and chemistry) it was true that until recent years most experiments were of this form and it was not necessary to use the more elaborate statistical techniques. Thus Dr. Robert A. Millikan used to reply when urged to use statistical methods that "a really good physicist designs and carries out his experiment in such a careful way that statistical methods are not required." In recent years when the fundamental problems in these sciences have become less readily accessible to experimental investigation, such a statement no longer holds. For frequently statisical methods must be employed to obtain significant information from even the most elaborate and carefully designed experiment. Furthermore, in biology and related fields where there are usually a large number of factors affecting the outcome of the experiments many of which it was impossible to control, it became clear very early that a statisical analysis was necessary before valid conclusions could be drawn.

In order to illustrate the statistical method, let us consider a particular example. A manufacturer of artillery shells has reason to suspect that a defective batch of fuses has been incorporated in a certain lot of shells. He knows that if the fuses are good, the chances are 999 in 1000 that the shells will explode, while if the fuses are defective the chances are only 1 in 2 that the shells will explode. He makes the hypothesis that the fuses are defective and performs the experiment of firing 10 shells. All 10 shells explode. What does he conclude concerning his hypothesis? Following the above procedure, a simple

probability calculation shows that if the hypothesis is true, namely if the fuses are defective, then the probability that all 10 shells will explode is $(\frac{1}{2})^{10}$ or approximately 1 in 1000. On the other hand, if the hypothesis is not true, namely if the fuses are good, another simple calculation shows that the probability that all 10 shells will explode is 99 in 100. He will thus conclude that contrary to his expectation, the fuses are indeed good. Moreover, he now knows what risk he is taking when he draws this conclusion. For either he is right and the fuses are good or he is wrong and an event, namely all 10 shells exploding, has occurred whose probability is 1 in 1000. In this sense he is taking a chance of 1 in 1000 of being wrong. Clearly information of this latter type cannot be obtained from the traditional method of interpretation.

This example also illustrates the fact that the statistical analysis may also contribute to the formulation of the experiment. A simple analysis along the above lines might have shown that the manufacturer would have gained sufficient information for his purposes by only firing five shells. Thus the expense of firing the additional five shells could have been saved. Furthermore, other possible experiments could be devised and analysed. The manufacturer would then choose the particular experimental procedure which minimizes the cost and risk. This application of statistics which is called "experimental design" has had a remarkable development during the past decade and is widely used in scientific experimental work.

Before concluding this description of the statistical method, some remarks should be made concerning the means by which knowledge of the laws governing the chance fluctuations present in the experimental procedure is obtained. First of all, it may happen that great many similar experiments under similar conditions have already been carried out. If this is the case, the results already obtained can be used to determine the underlying distributions of the chance fluctuations. Secondly, there is the possibility of using statistical tests which are independent of the nature of the underlying distributions. Such tests, which depend upon distribution-free statistics are usually not efficient since they must give valid results even when the most unfavorable distribution of the chance effects happens to be present. Finally, if there are no systematic errors in the experimental system, there is a fundamental theorem of statistics, called the Central Dimit theorem which asserts that the average of a large number of independent measurements will be approximately distributed according to the Gaussian or normal law. Thus in a well designed experiment it is always possible to be in the position of knowing the underlying laws governing the chance fluctuations by simply repeating the measurements a sufficient number of times.

In conclusion, we shall list some of the obvious implications of the inherently statisical nature of scientific knowledge as outlined above. First of all, statistical methods are intimately tied into the actual operations involved in the experimental procedure. For the calculation of the basic probabilities is determined by the details of this procedure. Thus it emphasizes again the basic operational character of scientific knowledge. Next it shows that with any scientific conclusion there is always associated a probability. By performing increasingly elaborate and careful experiments these probabilities can be made to approach certainties, they are still, however, probabilities. In this sense, there is nothing absolute about the conclusions of science. It is quite analogous to the situation in philosophy and theology where meanings of words are never entirely precise. With great effort the precision of the meanings may be greatly increased, but there is still a residue of ambiguity. Finally since statistical methods contribute to the formation of the experimental procedure and afford the means for a valid interpretation of the results, they form indeed the basic framework of the scientific method.

Scientific Facts and Theology

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I have rejoiced at the prospect of this meeting and have been very happy at the thought that we might get together, but now that the occasion has arrived and the meeting is under way, I am profoundly awed by the gathering of intelligence which is here. Being a jack of all trades and a master of none, I have serious question as to whether I shall make a very great contribution. My words will be few, relatively speaking! I follow Dr. MacRae in this, that I felt it totally impossible to prepare a paper which would be at all sure to fit into the program at this juncture. I have not come without preparation, but I am speaking without a manuscript.

Here we are as theologians receiving the impact of the study of science. I believe that is the point of view from which I am intended to speak. In the course of the past years and generations, science has come to certain conclusions. These conclusions in many points impinge upon theology. What effect does this have upon theology, and particularly upon our understanding of the doctrine of the inerrency of Scripture? "The Bible is the Word of God, the only infallible rule of faith and practice." "The Holy Spirit did so move, guide and inspire the writers of sacred Scripture as to keep them from error."

First of all, I should like to begin with Dr. Mickelsen's word emphasized this morning, the word, "interdependence". As a person who spends most of his time on the theological side rather than on the strictly scientific side, I am very conscious that the barriers on the borderline ought to be broken down, ought to be levelled. There ought to be a constant give and take over the border. In our day of specialization, as we seek honestly, as scholars, to go deeper into our fields, there is a psychological defense mechanism which grows up round about us, which elbows off those people who do not understand our particular vocabulary. Perhaps, the theologian has more of a consciousness of an interdependency than the scientific specialist. There is need of a strong emphasis on correlation and integration of different specialties. We are very likely to lose patience with one another. I develop my particular lingo, my particular jargon. I can usually understand what Professor Paul is talking about, but when he gets 10 miles ahead of me, I go look up the words in a dictionary, and I can follow along. But then someone comes up with a formula that has brackets and radical signs that irritate me. Why not talk English? I have to discipline myself to go back and look up the meaning of those signs, if they impinge upon my field. I need to be patient and try to understand. That man has his meaning in his technical vocabulary. I must understand him, I cannot expect him to come over into my field and learn my vocabulary. I have to learn his language, if there is to be any mutual support one of another in our common task.

On different occasions, in different group meetings, where some of you have been present, I have urged a greater patience, a greater tolerance with the misunderstandings which are likely to arise. I believe this emphasis should be coupled with much that has been said in the field of semantics. I like the good old word, lexicography. That suits me better than semantics. Lexicography includes both sematics and phonemics according to my old fashioned way of speaking, but whatever we call it we have to understand the vocabulary of one another and we have to be patient in developing this understanding of the vocabulary.

In the home of a physical scientist years ago he was showing me some of his microscopic work on polarized light. That is far from my field of understanding, but he caused me to look through a microscope. He told me that as the polarized light is seen through a certain piece of rock, the form of the cross appears.

So I looked into the microscope and I saw the form of a cross. I said, "Oh, yes, the cross is in the light, not in the rock." He said, "No, no, no, it's not in the light, it's in the shadow." "Well," I said, "that is exactly what I meant." When I said "light", I meant the light-shade pattern. He thought I meant the light part of the pattern.

So we were able to get together. I accepted his vocabulary, the cross was not in the light, but in the shadow. I try to be nimble with my tongue in that way, and I think we all ought to. If we find ourselves contradicting one another I think we ought to adopt the other man's vocabulary if we can, if we can find it workable.

The relationship between volition and cognition has been much discussed. I do not know that anyone in our generation will arise to a satisfactory defense of the propriety of admitting volition into cognition, but I feel very sure that there is a relationship, and a legitimate relationship. We are in an intellectual world of relative darkness and confusion. We have found ourselves in a deeply entangled jungle. By strenuous and patient effort to understand one another, we who have so much in common, may find a clear pathway, may find a way to a greater life, a greater liberty, a broader horizon and a deeper understanding. I feel that it is our *duty* to try to understand.

Our duty is to seek to use language so that we shall not merely say, "Oh, but this word in a peripheral usage has such and such a meaning, so therefore your statement must be ruled out." Since vocabulary must be understood in its universe of reference, let us all try to understand one another's vocabulary in a *common* universe of reference in so far as we can possibly do so.

There is sometimes a tendency to make a smart answer and to throw the talk into confusion by equivocation of terms. I do not mean equivocation in the sense of falsehood, but I mean taking terms in usages not intended by the speaker. You have all heard the reason why fire engines are red: because newspapers are read too, and two times two is four, and three times four is twelve and twelve inches makes a ruler. Now Queen Elizabeth is a ruler. Queen Elizabeth is also a ship. A ship sails on the ocean. The ocean is full of fish and the fish have fins. The Finns fought the Russians, the Russians are Red and fire engines are always Rushin' around. Therefore fire engines are Red too.

Words have their peripheral meanings. A Biblical exegete is an ex-prize fighter because an exegete is an expounder and an ex-pounder is an ex-pugilist, and an ex-pugilist is an ex-prize fighter.

By taking peripheral meanings of the words we can throw almost any argument into confusion. But if we seek to understand and try to develop mutual interdependence, realizing that we do have different languages, I believe that we have a great area in which we can be mutually helpful one to another.

Let me remark upon a certain verbal usage of Professor VanTil's. I do not believe that there is any basic disagreement in my mind with his magnificent paper which I so much enjoyed this morning. In his illustrations and definitions he seemed to be quite in harmony with the values which I believe should be emphasized in his field. There is, however, a group of theologians who would define Biblical hermeneutics as not in the genus hermeneutics. Thomas Aquinas, you know, said "God is not in any genus".

When we say God is "good", says Thomas, we do not mean anything like what we mean when we say "good" in any other context. Well, my reaction is then that we might just as well keep still. If we do not know what we are talking about we might as well cease to "darken counsel by words without wisdom." I refuse to use a word which I cannot define. I admit that there are some words with the definition of which I might have some difficulty, but if I cannot tell you what I mean by a word, I won't use it. I shall wait until I can look it up to see what the proper usage is.

If God is not a being, if God is not a substantive entity, if God is not a hypostasis with attributes, and if there are not other beings, then we do not have any God, we do not have any creation.

I feel we ought to take the position that Biblical hermeneutics is a branch of mermeneutics. I feel that every particular branch has its own specialty, but I feel that in the Bible we must recognize the laws of hermeneutics, general laws of hermeneutics, as Prof. VanTil emphasized magnificently this morning.

I feel that it is a special case that the Bible is the Word of God. That God is the ultimate source of the Bible does not change the fact that Biblical exegesis is a special branch of hermeneutics.

A color-blind man could not be competent in the exegesis of books on painting or books involving the discussion of color or the printing or sampling of color. A color-blind man may have cognition of color. He may figure out how to read the traffic lights by watching the rest of the traffic; he may know red, and green, etc., but he cannot have the experience of it. Therefore, though he may have cognition he cannot give competent pronouncements. I think that is a fair illustration of the fact that spiritual things are spiritually judged. The born-again man is the only one who can know, experientially, the meaning of the Twenty-Third Psalm. "The Lord is my shepherd . . . He restoreth my soul." No one who is not regenerated can know what these words mean. The unregenerate man can know the definitions of the words. He may even be able to define the denotations of the statements, but he is bound to assimilate the meaning to some merely humanistic category.

The same thing is true of other specialties. There must be a particular experience in order to the understanding of many different specialized kinds of literature. I feel that the common ground that we have between science and theology should cause us to avoid the thought that Biblical hermeneutics is not in the genus, hermeneutics. My quarrel on the subject is really a quarrel of words, as far as the paper of this morning is concerned.

Scientific Method

Much has been said about scientific method and the fact that no two people define it alike. I spent a considerable amount of time studying John Dewey's "five steps" and proved to my own satisfaction that he never intended those steps to be counted as five steps because when he describes what he thinks the scientific method is, he never describes it twice alike. Sometimes he has six steps, sometimes four, and sometimes seven. He simply had the idea that in scientific procedure, we meet a problem, we need to find the problem, we need to work out the hypothesis, we experiment around, we verify our hypothesis, and then we apply it to the situation. Sometimes it adds up to five steps and sometimes not. The very prevalent idea that John Dewey taught a five-step philosophy of science, I think, comes from the fact that so many high-school teachers studied *Education and Democracy* and in that particular one of his many books, the scientific method happens to add up to five steps. The scientific method is something very wonderful, but something upon which it is difficult to agree.

In the *Mein Kampf* of naturalism, *Naturalism and the Human Spirit*, Costello sums up the matter by saying that there are two things in which naturalists agree: One is that there is no God, and the other is that they are in favor of the scientific method; but none of them know what it is. That was Costello's summary. Randall in his summary agrees as far as the scientific method is concerned. The naturalists are all in favor of the scientific method, but there are no two of them who would define it in the same way.

So I rush in where angels fear to tread, to define scientific method. The investigation of the world of nature has given us *two great principles*, first, recognition of the *law of contradictories*, and the second, recognition of the *principle of causality*. I do believe that consciously or unconsciously every person who is worthy of being called a scientist believes in the law of contradictories; that is, two contradictory propositions cannot both be true. I believe that that principle is very important for theology. And I feel that coming into contact with people who emphasize the consistency of truth, the integration of truth, as they make progress in their fields, has cured many theologues of an irrational mysticism, and has brought us out into the open sunlight of the truth of God. If I am right in saying that the progress of science has meant directly or indirectly a recognition of the law of contradictories, I feel that this has been very helpful to Biblical hermeneutics.

Paul says in his second epistle to Timothy, God "cannot deny Himself." It is impossible for Him to deny Himself. In his epistle to Titus he says, "God who cannot lie." The author of the epistle of Hebrews (Heb. 6:18) says "It is impossible for God to lie." There have been theologians who represented God as contradicting Himself and then somehow decreeing that the contradiction should not be false. Having met scientific men who are seeking to be consistent, and not contradict themselves, I, personally, have rejoiced in the fact that the Bible teaches that God does not contradict Himself, He cannot deny Himself. The truth is the truth.

This does not mean that the truth is superior to God. God's own character is truth. I feel a responsibility as a theologian, to adhere to the truthfulness of truth. There are paradoxes in the sense of *apparent* contradictions, but I find myself unable to live with paradoxes. If you find a contradiction in the principles in which you are devising a certain machine or certain scientific process you cannot rest there, you sit up nights, you work, you study, you investigate and you find your error.

One time, twenty-two years after I had my university degree, I found that my mathematics was very weak. I took the University of Chicago refresher course in mathematical analysis, and then I went on and took more. In the process of my studies I found a triangle, a plane triangle, the three angles of which were greater than two right angles. It was quite late at night and my eyes were blurred with scholarship. What did I do, go out and write a book and revolutionize the world? No, I just took a couple of hours longer, until I found my mistake! We as theologians, cannot just close our eyes and sing "Blessed be the tie that binds our hearts in Christian love". I believe in holding hands and singing that song, but I do not believe that that is the cure of paradoxes. I feel that we are responsible before the world's intellectual conscience to present the truth of God consistently. Not that we claim that everything seems perfectly to harmonize. Of course there are problems; but we present an integrated system of doctrine of which no one needs to be intellectually ashamed. The scientific world has stimulated me to the integration of truth, and I feel it has stimulated many other teachers of theology in the same way.

Law of Causality

The law of causality: Immediately we fall into arguments of terminology. I have a feeling that Hume in denying the law of causality in the physical world, just gave another name to causality. It's notorious that Hume frequently asked the question, What is the cause of this absurd notion of causality? He told what he thought the cause was, falling back on causality, intellectually, to get rid of causality in the physical world. Whether they call it causality or not, or whether they merely call it uniformity of nature, I believe that the scientific world has made a great contribution in emphasizing that this is a world of causal relationships.

I can not say this without getting into metaphysics. I believe that the world is really there, and that the North American continent existed before the Norsemen discovered it. Before it was in any human records, it had a *Dasein* and a *Sosein*. There it was and so it was, and then later on it was discovered. I believe that the facts of geology were there before there were any human beings. They were there to be discovered.

The law of causality as carefully stated by Christian scientific men never rules out miracles. You know the experiment we all had in beginning chemistry, when we got hydrogen from zinc and sulphuric acid. I once said to a student, "Suppose that you fix up your apparatus and then you are otherwise occupied for a little time. When you come back to your apparatus there's no hydrogen in the bell jar. What would you say?"

"That is impossible," he said. "The law of the uniformity of nature requires that there shall be hydrogen there." The question was very stupid, but I said, "Suppose it wasn't there?" "It's got to be there," said he, "The stars in their courses would not go round if the hydrogen isn't there." Once more I said "But if it isn't there, what would you think?" Very indignantly he said, *"Then somebody interfered with the experiment."* That is exactly what I meant. Somebody did something.

In the best regulated laboratory in the world somebody can do something. And that is all we mean when we believe in a miracle. We do not mean any contradition in the laws of logic but we mean that Almighty God is a person, that He can do something, and He can operate upon nature if He chooses to do so. If the dead uniformly remain dead, and throughout all the course of human history the dead remain dead it does not follow that God cannot raise the dead. If the wages of sin is death, and this is a part of the historical uniformity of nature, it does not follow that God cannot give the gift of life. The gift of

God is eternal life through Christ. The laws of causality give me, as a theologian, the very basis for discriminating the acts of God. If I could not believe that, other things being equal, the laws of causality do not change, I should have no way of recognizing a miracle. A miracle is a personal act; John's word is a "sign". A miracle is a sign of a Cause of the unusual event; a *sign* of a direct action of God. We can recognize a miracle only if we know something of the relative uniformity of the natural process.

Let me just say a word in defense of my good old friend, Adam Smith. I have taught economics and I love the subject. Examine the books on economics, and I think without exception in every book that has any scholarly recognition, from Adam Smith on down you will find the phrase *ceteris paribus,* other things being equal. All they claim when they talk about economic laws is that *other things being equal,* such and such processes will occur. Economic laws are quite regularly stated thus by the economists. So it is in the statement of other laws of nature.

The World Is Round

Let me mention certain individual matters that have to do with science; science discovered that the world is round. Some people thought that theology was upset. We now have no problem at all. We look into the Bible in vain for any declarative teaching which indicates that the world is not round.

Earth Not the Center

Science discovered that the earth is not the center of the material universe. Right up to the current date you find atheistic philosophers, and people in other fields, saying that since the Copernican revolution, theology is relegated to mythology. I do not find any disturbance in my theology in the least, since we know that the practical way of viewing astronomy does not take the earth as the center of the universe.

Vastness of Universe

Consider the vastness of the material universe. I am quite intrigued by it. I have heard reputable scholars in other fields say, Now, since the great 200 inch telescope reveals the vastness of the universe, where is your Bible? David the shepherd, in the plains of Palestine, keeping his sheep, knew nothing of these things. The answer had been given long before the 200 inch telescope. The vastness of the universe has been emphasized in the past generation. I remember Dr. Dow, a very learned woman. Some of you sat in her classes, and heard her say. "In the Eighth Psalm I find all that is relevant as to the vastness of the universe, and now that mathematically I know that it is far far greater, so far as distances are concerned, than David probably thought it to be, still I cannot find anything relevant to my theology. David knew that this was a mighty big universe. Far too big for our emotional comprehension." The new discovery of the vastness of the universe has actually not been a problem to theology, it has produced a greater idea of the God of the Bible.

Antiquity of Universe

The antiquity of the universe has been a problem to some theologians, those who regard Ussher's dates printed in the King James Version of the Bible as a part of the Bible, and who read 4004 B.C. at the top of the first page. There are still some Christian people who have those views, but I think most educated Christian people know that the Bible does not give you the date of creation. Simply, "In the beginning God created the heavens and the earth." Now, by a convergence of evidence, the physicists of astronomy have come to some figures, the physical universe is four or five billion years old. That is all very interesting but I would say that it simply drives me deeper into the Scriptures and it makes the 19th Psalm and the 8th Psalm and certain astronomical references in Amos and in Isaiah far more wonderful. The vastness of it all!

Physical Changes In Universe

Another item of development in modern science which impinges upon theology, is the notion of nature of the physical earth. This earth as a physical body is going through certain stages. In all probability it will, one of these days, burn up. It is not made as a settled permanent dwelling for the human race. Now it is a training camp for us. It had a previous history, and it is going on into an uninhabitable stage. Those who have taken the verses referring to the "everlasting hills" as teaching that the hills are mathematically everlasting, that there never will be any change in the shapes of the mountain ranges or anything of that kind, have misunderstood the Scripture. "The everlasting mountains were scattered, the perpetual hills did bow." (Habakkuk 3:6) The Bible really tells us that "the things that are seen are *proskairos,* the things that are seen are temporary." Peter tells us that this sidereal universe is headed for a cataclysm and that God is going to make a new heaven a new earth. Whether He will use the same atoms or not does not concern me. The temporal qualities of the physical earth, the past history and the future probable development are not in any sense contrary to what the Bible says.

The Expanding Universe

Emotionally, I have been disturbed more by the theory of the expanding universe. I cannot find a sentence in the Bible that contradicts it, but it bothers me. Why should God have done it that way? I thought that He just put together a nice little piece of mud, and fixed up this earth, and spun it around, fixed the sun and the stars up there to give light, and then worked out His plan for men on the earth. Well, now that is my childish picture. The Bible does not tell me that. The expanding universe, think of it! All these bodies receding from some primitive explosion which set them off. It is disturbing, but theologically I cannot find any difficulty. Personally, I have come through

the emotional negative reaction and I have looked up to heaven and said, "Lord, I accept the universe," whether it is expanding or not.

I have read of an alternative possibility. There may be a fatigue factor in light as it travels through vast astronomical distances, and possibly this accounts for the skewing of the spectrum, rather than the expansion of the universe. I still, in my old age, hope that the universe will slow down in its rapid expansion, but I can settle that wish as a purely emotional childish reaction. It does not affect my theology, it does not affect any verse in the Scripture. If God chose to do it that way, then that is the way He chose to do it. Let us go on and study and see what happens.

Antiquity of Men

In my own experience one of the most troublesome problems right now, a question among our friends, is the problem of the antiquity of man. I have spoken on this before so I shall not repeat myself. If you will compare the genealogy in Matthew, chapter 1; with the genealogies in the Old Testament, you will be driven to the conclusion that what the Hebrews meant when they gave geneologies was not continuous history, but highpoints. Matthew was not a simpleton. I discovered a year or so ago that Nagel and Cohen in their "Logic" cite Matthew's geneology as an illustration of the fact that any false witness ought to be thrown out of court. Matthew gives you 3x14 equals 40, they say. Obviously, 3x14 does not equal 40. Therefore, everything that Matthew has to say should be thrown out.

Matthew was not talking about figures to add up. He gives you 14 names, then the last name in this column is the first one in the next. The fourteens are for mnemonic purposes, to help you remember. The last name in this 14 is the first one in the next, so children can memorize the list most easily. Matthew knew what three times 14 would equal mathematically. The Gospel of Matthew has been one of the most influential pieces of literature in all human culture, and it was not written by a nitwit. He just did not intend his figures to add up. He did not mean 3x14 in a mathematical equation, but three sets of 14 names, with the overlapping of one name in each particular set. That is what he meant by what he said.

It is also very clear, that when Matthew said so and so begat so and so, he did not mean, that so and so was the immediate pro-genitor in the line of physiological heredity. "Begat" in Matthew's vocabulary very clearly means "was the predecessor of". So and so could have been the great great grandson, or an adopted son, or nephew. What he meant was to give three sets of fourteen outstanding names. He wrote for people who knew the Old Testament. He wrote for people who were greatly interested in their own geneologies, people who would immediately recognize that he had left out many names. He never intended his list to be added up.

There are other illustrations that would be interesting for some of the Old Testament scholars to work out, illustrations of the principle as it occurs in other Old Testament geneologies. The fact is that when the Hebrews gave their geneologies, they did not pretend that the lists could be added up. They intended to give summaries only, with indefinite gaps understood.

I feel therefore, that the question of the antiquity of man is no problem for theology. Personally, I am convinced that there are human remains far older than 4004, B.C. You find definitely human remains in layers of limestone indicating great antiquity. There was a "Java man". When did he live? I do not know, but I am sure he lived somewhere in the 5th chapter of Genesis, maybe in a gap, or maybe he was one of those named. The 5th chapter of Genesis is not intended to give figures that can be added up. Perhaps the names are dynasties in many instances. At any rate there is no intention to indicate that there were no gaps and gaps there surely were.

Now I did not invent this interpretation for myself, to protect myself against scientific facts. I read the same explanation in substance in Davids' Bible Dictionary long before I ever saw convincing evidence of the great antiquity of man. John P. Davis of the old Princeton, that great scholar, discussed the geneologies of Genesis and showed that we do not have any data in the Bible as to the antiquity of man. If the Bible does not give you any data as to the antiquity of man, we do not need to create a battle, where no battle exists.

Probability

I would say one final word with reference to the "Probability" question. I am greatly intrigued by what has been said here. Charles Saunders Peirce, the great logician, wrote a magnificent article on "Probability" in Baldin's Dictionary of Philosophy. He gives the essential principles of what has been said here today though he does not go into the intricacies. There have been many very significant developments in recent years in probability theories, but I think Peirce had the logic of probabilities quite well worked out in that article.

The logic of probability in science does impinge upon theology. Suppose we say that all scientific argument is probability argument. Many scientists would say that. There have been silly scientists, or maybe great scientists who had a silly streak, who have said, "Science gives you absolute truth." It does not, and generally speaking, it does not claim to. We have been told today, very effectively that as economics says *ceteris paribus,* so scientific statements say *Within certain limits of error the probabilities are such and such.* The problem is, if scientific statements are probability statements, what kind of a statement can you get in human language that does not in some way contain this element of probability? You have the old

theistic arguments, your inductive arguments for the existence of God, the arguments stated in the first chapter of Romans and other portions of the Scriptures. The invisible attributes of God, His eternal power and divine character, are known, since the creation of the world, by the things that are made, so that men are without excuse. This is the cosmological argument. But if that turns out to be a probability argument, are these men without excuse? Paul says they are. If there is a strong probability that this building is going to collapse over our heads, we have a moral responsibility to do something about it. The Bible teaches that men are morally responsible for their rejection of the Gospel. They are without excuse. The evidence is so overwhelming.

I believe in tomorrow morning's sunrise. I am orienting my life toward it. I expect to set my alarm clock, if I need to, with reference to it. I never saw tomorrow morning's sunrise. I think it is going to come. Probably it will. Everything is for it, nothing is against it. Yet I am more sure of the Gospel than I am of tomorrow's sunrise.

As a theologian, I would say, a probable argument is something quite different from a probable truth. A probable argument that you are going to fall down on the ice and bump your head does not mean just a probable bump when the bump comes. A probable argument for a sunrise does not mean that the sunrise is only probable. Probability relates to proposition, or statements, or arguments, or relates to expressions of opinion. The facts of the ontological universe are there. Or they are going to be there when the time comes, so that the emphasis on the part of modern science upon the nature of reasoning, the probability of reasoning, to me is not disturbing. When I preach a sermon I might make an error in something which I might say, but that does not mean that the Gospel I preach is only probable. The Gospel is revealed from heaven. God came down, lived upon this earth, and after His resurrection. He showed Himself to His disciples by many infallible proofs. He did not say, You must receive me mystically, by some *nth* dimensnon, and adhere to faith in me contrary to the evidence. He said "Handle me and see." One of the most beautiful expressions bearing upon the correlation of science and theology is in those words of Christ, "Handle and see." The resurrection of Jesus Christ was in tangible form. His body was supernatural but it was tangible. He presented Himself to His disciples by many infallible proofs, by the space of 40 days. "Handle me and see." So the Lord has given us good evidence and the scientist increases our appreciation of it.

Difficulties Concerning Biblical Chronology and Their Solution

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The chronological problems of the Bible are legion and have no single and easy solution. The problems of Genesis are different from those of Exodus and Judges, and these in turn are of an entirely different nature from those of Chronicles and Kings. It will be my purpose in this paper to discuss certain of the chonological problems in the period of the Hebrew kings.

For the period of the monarchy it will be discovered that the chronological problems fall into a number of different patterns and that no single over-all solution exists. Each area provides its own characteristic problems, all calling for their own individual solutions.

First comes the period of the united monarchy. During this period there were three rulers and each is given a reign of forty years. Outwardly this appears to be simplicity itself, but the very simplicity makes the chronological problem of that time, for the present at least, incapable of solution. Possessing only one set of data,—the lengths of reign of the kings,—there is no way of checking on the nature of the data involved. What method did the scribes employ in the reckoning of regnal years? Are the figures given for the lengths of reign to be regarded as merely approximate or as absolute? To what extent might coregencies have been involved? How did the years of this period compare with the years of contemporary history? Until answers to these questions can be secured no final reconstruction of the chronology of the period of the united monarchy will be possible.

The period of the divided monarchy provides an abundance of chronological material. There are figures for the lengths of reign of the ruler of both Israel and Judah and also synchronisms for the accessions of the rulers of each nation with the corresponding years of the other nation. We are thus provided throughout with four sets of chronological data which can be used as checks against each other. The difficulty, however, is that the data seldom seem to agree. Synchronisms do not seem to harmonize with the lengths of reign, and the lengths of reign for the one nation do not appear to harmonize with the lengths of reign for the

other. Comparisons with the contemporary chronology of the surrounding nations, moreover, frequently make it appear that agreement with any group of biblical data seems an impossibility.

Let us notice the difficulties involved in the biblical data from one fixed point to another,—from the disruption of the monarchy when Rehoboam and Jeroboam came to the thrones of Judah and of Israel, to the deaths of Ahaziah of Judah and Jehoram of Israel at the hands of Jehu. According to the data of the lengths of reign there are 95 years in Judah for this period as against 98 years in Israel, while according to the synchronistical data there are 97 years in Judah as against 94 years in Israel. Which is the correct total? The answer is, none of these. To secure the correct answer it is necessary to carefully analyze the data in order to discover the methods of chronlogical reckoning employed, and also to ascertain whether or not coregencies were involved.

There are difficulties at times in determining the length of reign of individual kings. Take Zimri, for instance. His length of reign is given as 7 days (I Kings 16:15). He came to the throne in the 27th year of Asa (I Kings 16:10,15) and the synchronism of his successor Omri is the 31st year of Asa (I Kings 16:23), which would give him a reign of 4 years. And how long did Omri reign? The official length of his reign is given as 12 years (I Kings 16:23). But the synchronism of his ascession is given as the 31st year of Asa (I Kings 16:23) and of his death as the 38th year of Asa (I Kings 16:28,29), which would make 7 years. But if the length of Omri's reign is to be reckoned from the time when he overthrew Zimri and took the throne in the 27th year of Asa (I Kings 16:15,16) to his death in the 38th year (I Kings 16:28,29), the length of his reign would be 11 years. So how long did Omri reign,—7, 11, or 12 years?

Further difficulties arise from the fact that at times more than one synchronism is given for a king's accession. Jehoram of Israel, for instance, is said to have come to the throne in the 18th year of Jehoshaphat (II Kings 3:1) and also in the 2nd year of Jehoram, son of Jehoshaphat (II Kings 1:17). And Ahaziah of Judah is said to have begun his reign in the 11th year of Jehoram of Israel (II Kings 9:29) and also in Jehoram's 12th year (II Kings 8:25).

There are other difficulties which seem to be even more perplexing. Jehoram of Israel, for instance, is said to have begun his reign in the 2d year of Jehoram of Judah (II Kings 1:17), but Jehoram of Judah began his reign in the 5th year of Jehoram of Israel (II Kings 8:16). According to these data each of these kings began to rule before the other, Jehoram of Judah having been on the throne 2 years before Jehoram of Israel, and Jehoram in Israel having reigned 5 years before Jehoram of Judah.

While it may sound ridiculous, let it be said that all the above data are perfectly sound and may be fitted into a perfectly harmonious chronological picture, consistent with itself and in harmony with the fixed chronology of contemporary nations. But in struggling with these difficulties in the biblical data many scholars have regarded the data as erroneous and in need of correction. This has been true throughout the Christian centuries, and was true as long ago as two or three centuries before the beginning of the Christian era and also in the years immediately following the time of Christ, as witnessed by the adjustments made in these data in the Septuagint and the writings of Josephus.*

*For a discussion of these variant data in the Septuagint and Josephus and an explanation of how they arose see my, *The Mysterious Numbers of the Hebrew Kings*, (Chicago, 1951), pp. 167-227.

At times, also, the chronological data seem to call for interregna between the reigns of various kings, and a number of systems of chronology weave these seeming interregna into their patterns of reigns, thus endeavoring to solve many of the chonological difficulties. Let it be said, however, that a gap of a number of years in either Israel or Judah without a king upon the throne would be extremely unlikely, and if a number of imaginary interregna would be woven into a chonological pattern, the result would be a drawing out of the years involved beyond the limits of absolute time and beyond the years of contemporary nations. That is one reason why the patterns of Ussher, Anstey and others are longer than the years of contemporary Assyrian history. Let us present two instances where it may appear that interregna occur. Amaziah of Judah lived 15 years after the death of Jehoash of Israel (II Kings 14:17). The successor of Jehoash was his son Jeroboam II, and Amaziah's successor was Azariah who came to the throne in the 27th year of Jeroboam's reign (II Kings 15:1). It would thus appear that there was a gap of 12 years between the death of Amaziah and the time that his son Azariah began to reign. Jeroboam reigned 41 years (II Kings 14:23), which would bring his death 14 years after Azariah's accession in his 27th year (II Kings 15:1). The successor of Jeroboam was his son Zachariah who began to reign in Azariah's 38th year (II Kings 15:8). That would make it seem that Zachariah did not begin his reign until 24 years after his father's death. The fixed years of contemporary Assyrian chronology, however, show that such interregna as these are entirely out of the question. The solution of this problem will be presented later in this paper in a discussion of the chonological pattern of that time.

We have called attention to only a few of the difficulties that exist in the chronological data in the period of the divided monarchy, but it will be apparent that the multiplicity of data available for that time only adds to the complexity of the problem and the difficulty of its solution. Following the fall of Samaria when there existed only the nation of Judah, we

possess merely a single set of chronological data; namely the lengths of reign of the rulers of the southern kingdom. But with the aid of Assyrian and Babylonian material it is possible to reconstruct a sound chronological pattern for that period of Hebrew history.

It will be noticed that we have mentioned three main areas of chronology for the Hebrew kings; namely, 1) The period of the united monarchy, 2) The period of the divided monarchy, and 3) The period of the kings of Judah following the fall of Samaria. The second of these main areas, that of the divided monarchy, can again be subdivided into a number of periods each with its own distinctive chronological pattern. We will discuss in brief a number of these.

First let us notice the period from the disruption and the accessions of Rehoboam in Judah and Jeroboam in Israel to the time of Jehoshaphat in Judah and Jehoram in Israel. When the data of synchronisms and lengths of reign for this period are carefully examined it will be discovered that they provide a pattern where the official regnal totals of Israel increase by one year over the totals of Judah for every reign. This period I have previously discussed* and I can give here only the main details. In noticing the lengths of reign of the kings of Israel for this period it will be seen that the number given is one year higher than the length of reign according to the synchronisms. Nadab of Israel, for instance, came to the throne in the 2nd year of Asa and was succeeded by Baasha in the 3d year of Asa, which would give him a reign of one year according to the synchornistical data, whereas he had an official reign of two years (I Kings 15:25). Baasha came to the throne in the 3d year of Asa and was succeeeded by Elah in Asa's 26th year, giving him a reign of 23 years according to the synchonisms as against an official reign of 24 years (I Kings 15:33). Elah came to the throne in Asa's 26th year and was succeeded by Zimri in the 27th year, thus giving him a reign of one year according to the synchronisms but he had an official reign of two years (I Kings 16:8). Zimri came to the throne in Asa's 27th year and reigned only seven days when he was succeeded by Omri (I Kings 16:15,16). Omri must, then, have commenced his reign in Asa's 27th year, and he was succeeded by Ahab in the 38th year (I Kings 16:29), thus giving him a reign of 11 years according to these synchronisms against an official reign of 12 years (I Kings 16:29). According to I Kings 16:23 Omri began his reign over Israel in Asa's 31 years, but a glance at the previous verse will make it clear that that was the year in which Tibni, who had been reigning over one part of the land of Israel, died and when Omri began his rule over the entire northern kingdom. The last king where the characteristic pattern of this area is found is Ahaziah of Israel who came to the throne in the 17th year of Jehoshaphat and was succeeded by Jehoram in Jehoshaphat's 18th year, thus giving him a reign of 1 year according to the synchronisms as against an official reign of 2 years (I Kings 22:51).

What is responsible for this phenomenon of an official reign one year longer than it is according to the synchronisms, and an entire period in which the regnal totals of Israel increase by one year for every reign above the regnal totals of Judah? The reason is found in the use of two different chronological systems in Israel and Judah. According to accession-year reckoning (postdating) the balance of a calendar year in which a king comes to the throne is termed his accession year, and the first official year is not reckoned until the new year's day following the ruler's accession. According to this system of reckoning, the year in which a king dies is credited to him alone and not to his successor, and official years reckoned according to this system will be in accord with actual years. According to nonaccession-year reckoning (antedating) a new king begins counting his first year of reign from the day that he ascends the throne, and the year beginning with the next new year's day is termed his second year. According to this system, therefore, the year in which an old king dies and a new king begins his reign is always reckoned twice,—as the last year of the old king and the first year of his successor. The year that is termed the first year according to accession-year reckoning is termed the second year according to nonacession-year reckoning. It will be obvious that regnal totals reckoned according to such a system will increase by one year for every reign over absolute time and also by one year for every reign over regnal totals reckoned according to the accession-year method. It will therefore be clear that for the period under discussion Judah is using accession-year reckoning and Israel is using the nonaccession-year method.

In order to secure absolute rather than official totals for Israel for the period under discussion it will be necessary to reduce the official length of each

*Edwin R. Thiele, "A Comparison of the Chronological Data of Israel and Judah," Vetus Testamentum, IV (1954), 185-191.

Regnal Years for Judah and Israel from Rehoboam to Jehosphaphat

Totals:	17	20	22	23	46	47	58	61	78	79
Rehoboam	17'Abijam	3'Asa	2d	3d	26th	27th	38th	41'Jehosphaphat	17th	18th
Jeroboam			22'Nadab	2'Baasha	24'Elah	2'Zimri Omri 12	'Ahab	4th	22'Ahaziah	2'Jehoram
Totals:			22	24	48	50	62	66	84	86
Excess years for Israel:			0	1	2	3	4	5	6	7

Israelite reign by one year. When this is done the results are as follows:

Ruler of Israel	*Official years*	*Actual years*
Jeroboam	22	21
Nadab	2	1
Baasha	24	23
Elah	2	1
Omri	12	11
Ahab	22	21
Ahaziah	2	1
Totals	86	79

Let us notice how these totals for Israel compare with the totals of Judah for the period under discussion:

Ruler of Judah	*Official years*	
Rehoboam	17	
Abiajm	3	
Asa	41	
Jehoshaphat	18	
Totals	79	(Year of Jehoshaphat when Ahaziah died and Jehoram reigned. See II Kings 3:1)

From the accession of Jeroboam to the death of Ahaziah there is an official total of 86 regnal years for Israel as against 79 for Judah. This seeming discrepancy, however, immediately vanishes when the systems of chronological reckoning employed in the two nations are understood. Scholars ever since the years of the pre-Christian era have, in their struggles with the chronological problems of this period, felt that the biblical data must be in error and in need of correction. In spite of the seeming insuperable difficulties, however, it can be pointed out that the chronological data in Kings for this period are entirely correct and can be fitted into a perfectly harmonious pattern when the basic chronological principles employed by the Hebrew scribes are taken into consideration.*

With the reign of Ahab we reach a point where contact is made with the contemporary chronology of Assyria and from this point onward interesting comparisons can be made between Hebrew and Assyrian years. Shalmaneser III tells us that in the 6th year of his reign, in the eponomy of Daian-Assur, he fought against Ahab in the battle of Qarqar. That was 853 B.C. And he also informs us that in his 18th year, in the eponomy of Adad-rimani, he received tribute from Jehu. That was 841. Between these years must be fitted the reigns of Ahaziah and Jehoram which total 14 official years (2 for Ahaziah and 12 for Jehoram) or 12 actual years (1 for Ahaziah and 11 for Jehoram). It is thus that we secure the dates of 841 for the accession of Jehu and 853 for the death of Ahab. And having the year fixed for the death of Ahab, we can reckon back 79 years and thus secure the date for the disruption and the founding of the rival monarchies of Israel and Judah.

A number of chronological problems are found in the short period following Jehoshaphat's 18th year and the accession of Jehoram in Israel and extending to the reigns of Athaliah in Judah and Jehu in Israel, which we cannot here discuss. But we can say that the two synchronisms given for Jehoram's accession in Israel,—the 18th year of Jehoshaphat (II Kings 3:1) and the 2d year of his son Jehoram (II Kings 1:17) do not involve a discrepancy but merely point to a coregency of Jehoram with his father Jehoshaphat, —the 18th year of Jehoshaphat being the 2d year that his son sat with him on the throne. It will also be of interest to note that the year in which Jehoshaphat made his son coregent was the year in which he joined forces with Ahab in the struggle against Syria for Ramoth-gilead, on which occasion the life of Jehosaphat was seriously endangered and Ahab was slain (I Kings 22:32-35). It will thus be observed that it was a matter of mere prudence that led to this coregency. Jehoram reigned with his father 2 years in Judah before Jehoram came to the throne in Israel. The synchronism given in II Kings 8:16, of Jehoram's accession to the throne of Judah in the 5th year of Jehoram of Israel is the time when Jehoshaphat died and when Jehoram began his sole reign. Thus Jehoram reigned 2 years in Judah as coregent with his father before Jehoram came to the throne of Israel, and Jehoram reigned 5 years in Israel before Jehoram began his sole reign as king of Judah.

In the next succeeding period we discover an entirely different chonological pattern. This period begins with the simultaneous accessions of Athaliah in Judah and Jehu in Israel and extends to the reigns of Azariah in Judah and Pekahiah in Israel. Let us notice the details. In Judah Athaliah reigned 7 years, Joash 40 years, and Amaziah 29 years, or a total of 76 years to the accession of Azariah in the 27th year of Jeroboam II of Israel (II Kings 15:1). For Israel the years of this period are as follows: Jehu 28, Jehoahaz 17, Jehoash 16, and Jeroboam 27 up to Azariah's accession, or a total of 88. This is 12 years in excess of Judah's total of 76 at this time. It can be shown that this excess for Israel has not been gradually accumulating but appears here for the first time, for

*For a more complete discussion of the principles involved and the various chronological problems of this period see my, **The Mysterious Numbers of the Hebrew Kings**, pp. 14-41, 55-61.

Regnal Years for Judah and Israel from Athaliah to Azariah

Excess years for udah:												12
Totals:	7					47		61		76		114
Athaliah	7' Joash					40' Amaziah				29' Azariah		38th
Jehu		28' Jehoahaz		17' Jehoash	2d		16' Jeroboam		27th		41' Zachariah	
Totals:		28'		45	47		61		88		102	
Excess years for Israel:									12			

Amaziah in Judah died 15 years after the death of Jehoash of Israel (II Kings 14:17), which gives a total of 61 years (76 minus 15) for Judah at that time. And that is identical with the total for Israel at the death of Jehoash (28 for Jehu, 17 for Jehoahaz, and 16 for Jehoash). And at the next previous point of comparison,—the death of Joash of Judah in the 2nd year of Jehoash of Israel (II Kings 14:1),— the totals for the two nations are again the same; namely 47 years (for Judah 7 years for Athaliah and 40 for Joash, and for Israel 28 years for Jehu, 17 for Jehoahaz, and 2 for Jehoash, when Joash died and Amaziah began his reign. It is clear then, that up to the death of Jehoash in Israel 15 years before the death of Amaziah in Judah, the regnal totals of the two nations are the same. But at the next succeeding point of comparison, the death of Amaziah in Jeroboam's 27th year, the total for Israel is 12 years higher than that of Judah. It is therefore at this very point that the cause for this excess must be sought. An examination of the data makes the matter perfectly clear. It will be remembered that the death of Amaziah in Judah took place 15 years after the death of Jehoash in Israel (II Kings 14:17) and that Amaziah was then succeeded by his son Azariah in the 27th year of Jeroboam the son of Jehoash (II Kings 15:1). If Jeroboam had already reigned 27 years, 15 years after the death of his father, he must have ruled 12 years before his father's death. It is this coregency of 12 years of Jeroboam with Jehoash* that is responsible for Israel's total of 88 regnal years as against 76 for Judah at this point. In order to secure a total of absolute rather than official years for Israel it will be necessary to deduct the 12 years of Jeroboam's coregency. This gives us a basic total of 76 years for Israel in the 27th year since Jeroboam began his coregency, and this is identical with the figure for Judah at Amaziah's death. It will be necessary to keep this fact in mind when we come to the next point of comparison.

Jeroboam had a reign of 41 years (II Kings 14:23) when he was succeeded by his son Zachariah in Azariah's 38th year (II Kings 15:8). The official total for Israel up to that point thus is 102 years (28 for Jehu, 17 for Jehoahaz, 16 for Jehoash, and 41 for Jeroboam) or a basic total of 90 years after the deduction of 12 years of Jeroboam's coregency, For Judah, however, the total has now reached 114 years (7 for Athaliah, 40 for Joash, 29 for Amaziah, and 38 for Azariah), which is 12 years higher than Israel's official total or 24 years above her basic total. What is responsible for this excess in the years of Judah?

It will be remembered that Jeroboam had reigned 27 years in Israel at the time of Amaziah's death and Azariah's accession (II Kings 15:1). Since Jeroboam reigned a total of 41 years (II Kings 14:23), he was on the throne 14 years after Amaziah's death when the accession of his son Zachariah took place. But when Zachariah came to the throne Azariah had already been ruling 38 years (II Kings 15:8) and that was only 14 years after his father's death. So he must have ruled 24 years before his father died. And that being the case it will be obvious that in order to secure a basic rather than an official total of years for Judah at this point, the 24 years of Azariah's joint reign with his father must be subtracted from the total of 114 years. That gives us 90 years for Judah in Azariah's 38th year,—the same basic figure that we have for Israel at that point. It will be clear, then, that once the joint reigns of Jeroboam and Azariah with their fathers are taken into consideration, we have a chronological pattern for this period in which the regnal years of Judah and Israel are running parallel with each other (47 for the two nations at the death of Joash in Judah in the 2d year of Jehoash in Israel, 61 years at the death of Jehoash in Israel 15 years before the death of Amaziah in Judah, 76 years at the death of Amaziah in Jeroboam's 27th year, and 90 years at the death of Jeroboam in Azariah's 38th year). The fact that the regnal totals of the two nations are the same can only mean that both nations are now using the same method of chronological reckoning, and that somewhere along the line a shift from the systems evidenced in the previously considered pattern had taken place.* It should also be remembered that in order to secure absolute rather than official years it will be necessary henceforth to subtract 24 years from the regnal totals of Judah and 12 years from the totals for Israel. The same basic pattern that we have been discussing continues through the reigns of Azariah in Judah and Pekahiah in Israel.

The period immediately before us, beginning with Jotham in Judah and Pekah in Israel and extending to the termination of the northern monarchy, is the most difficult and involved in Hebrew history. Into the intricacies of that problem we cannot enter here,** but we can only attempt a brief setting forth of the main features. When carefully examined it will be found that the chronological data for this period can no longer be fitted into a single harmonious pattern, but that two variant patterns prevail. Certain of the data call for one pattern, and others call for another. When these two patterns are superimposed upon each other, a single pattern results which will make clear exactly what has taken place and which will provide a chronological scheme in complete agreement with Assyrian history. This is a time when both Israel and

*For the reasons for this joint reign and the overlapping reign of Azariah with Amaziah in Judah and additional evidences therefor, see my article, "A Comparison of the Chronological Data of Israel and Judah," **Vetus Testamentum**, IV (1954), 191-195.

*For an account of the methods employed and the time and probable reasons for the adjustments made see my, **The Mysterious Numbers of the Hebrew Kings**, pp. 36-41, 63-68.

For a more complete discussion of this period see my, **The Mysterious Numbers of the Hebrew Kings, pp. 99-152.

Judah were having numerous contacts with Assyria,—contacts mentioned in both the Old Testament and in the Assyrian records. A correct reconstruction of the chronological outline of this period is altogether imperative if a correct correlation between biblical and secular history is to be secured. Let us call attention to only a few of the basic details.

Azariah in Judah had a reign of 52 years and was succeeded by his son Jotham. The synchonism given for Jotham's accession is the 2d year of Pekah in Israel (II Kings 15:32). And Pekah came to the throne in the 52d and last year of Azariah (II Kings 15:27). It would thus appear that Jotham and Pekah began their reigns at practically the same time; namely, at the close of Azariah's reign.

The length of Jotham's reign is given as 16 years (II Kings 15:33)). But according to II Kings 15:30 Hoshea began his reign in Jotham's 20th year, thus indicating that in one sense Jotham had a reign as long as 20 years. The successor of Jotham was Ahaz who reigned 16 years (II Kings 16:2), and Ahaz was followed by Hezekiah. On the basis of a 20-year reign for Jotham we would thus have a total of 36 years from the death of Azariah to the accession of Hezekiah. In Israel for the same period we have a reign of 20 years for Pekah (II Kings 15:27) who was followed by Hoshea and in whose 3d year Hezekiah is said to have commenced his reign (II Kings 18:1). That would give a total of 36 years for Judah as against 23 years for Israel, or an excess for Judah of 13 years.

A second synchronism, however, places the accession of Hoshea in the 12th year of Ahaz (II Kings 17:1) rather than the 20th year of Jotham (II Kings 15:30). If both of these synchronisms are correct and if both apply to the same year, then the 20th year of Jotham is equated with the 12th year of Ahaz, and the reign of Ahaz would thus overlap that of Jotham by 12 years. According to such a pattern we would have 24 years for Judah as against 23 years for Israel, which is practically the same. Against such a reconstruction, however, is the synchronism for Ahaz's accession, which is the 17th year of Pekah (II Kings 16:1). That synchronism would appear to be correct on the basis of a 16-year reign for Jotham which began at amout the same time as did that of Pekah (in Pekah's 2d year according to II Kings 15:32). If Jotham and Ahaz each ruled 16 years, Hezekiah would have begun his reign 32 years after the death of Azariah, which is 9 years in excess of Israel's figure of 23 years at that point. In such a case, however, a number of chronological data would have to be sacrificed, including the two synchronisms for Hoshea's accession.

No attempt has been made here to do more than give a faint hint at the many intricacies of the chronological problems of this period of Hebrew history. Suffice it to say that we can see no way of harmonizing all the data within a single chronological pattern. Given two superimposed patterns, harmony is possible for all the data and providing years of Hebrew history which are in accord with those of Israel's neighbors.

After the fall of Samaria Judah is the only Hebrew monarchy, and instead of four sets of chronological data we henceforth have only one; namely, the lengths of reign of the rulers of Judah. That, at first glance, would seem to simplify the reconstruction of this period of Hebrew history. It must be remembered, however, that the only means by which a reconstruction of the previous periods of Hebrew history has been made possible is by a use of all the data, including synchronisms for the two countries as well as lengths of reign. Due to the paucity of data we now find ourselves unable to tell if a coregency had taken place or if some other peculiarity (such as a change of method in reckoning regnal years) had occurred. However, there are a number of contacts with Assyria and synchronisms with Babylonian kings which go far toward making possible a trustworthy reconstruction of Hebrew chronology for the closing period of Judah's history.

In the limits of this paper it has not been possible to do more than present some of the main features of the chronology of the kings. But we have tried to show that, difficult though those problems may be, they are not beyond solution. Careful analysis of each particular area reveals the basic nature of the chronological problem involved and points the way to its solution. Hebrew chronology is more than a collection of guesses on the part of scribes who did not know the complete nature of the data with which they had to work. The men were human, but they were honest, careful, and well-informed. By a careful study of the data they have made available to us, Hebrew chronology can today be placed upon a basis which is both scientifically and historically sound.

Some of the Problems of Chronology in Genesis

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We accept the infallibility of Scripture. We also interpret Genesis, chapter one, to involve a miraculous creative activities of God. The supernatural character of these activities is far more important than the length of the day, in this chapter. These supernatural, creative activities are truly revealed by God to man in Scripture. But this does not at all imply that the activities are intended by God to be fully understood by man. What we do understand is that the Sabbath was made for man. Meanwhile, "It is the glory of God to conceal a matter, it is the glory of kings to find it out," says the Book of Proverbs.

It is the glory of God to conceal the structure of the atom, especially of the heavy elements and of Carbon 14, it is the glory of the kings of science to find it out.

But while they find it out, our problems of chronology in Genesis increase.

The text of Genesis 1 and 2 puts us on our guard that there are problems of chronology here. This text is correctly translated in Harper's "Hebrew Method and Manual," as far as the chronology is concerned, as follows: Day one, a second day, a third day, a fourth day, a fifth day, the sixth day and the seventh day.

The sixth day,—does the article look forward to the presence of the article in *the* seventh day, or backward to the absence of the article in all the prior days? Evidently *the* sixth day looks forward to *the* seventh day. But why then the absence of the article with all the days of Genesis I before *the* sixth day? The Scriptures do not tell us but they thus put us on our guard that there are mysteries here.

But how about the word day? It is used in three senses in the story, day versus night, day including night, and day including the entire series of six days, in the expression: "These are the generations of the heavens and the earth in the day that they were created," in Genesis 2. Such a variety in the usage of the word day should put us still more on our guard.

And the seventh day is not delimited by evening and morning, like the prior days. Both Bavinck and Aalders use this argument from silence to argue that the seventh day is a long period, not delimited by an ordinary evening and morning.

But an occasional evening and morning is also peculiar in Scripture: "At evening time there shall be light,"—we read in Zechariah 14:7 and morning in Psalm 49:14 has a peculiar usage: "They are appointed as a flock for Sheol; Death shall be their shepherd: and the upright shall have dominion over them in the morning."

Not morning but day is used somewhat peculiarly in the title of the Egyptian Book of the Dead: "The coming out into the day." All is night here, but in heaven there shall be no night. If the soul should be weighed in the balance and not found wanting, it experiences "the coming out into the day," at least hypothetically.

But that day of heaven is a long period of light. And so the title of the Egyptian Book of the Dead contains the word *day* as a period. It is probable that the Israelites in Egypt knew this expression "the coming out into the day," and its usage involving a long period of light, in that title.

Whether such knowledge would put them on their guard still more in interpreting the word day in Genesis 1 and 2 is hard to say. But the opportunity was there. In Psalm 90 we have a peculiar expression in a context concerning creation, "before the mountains were brought forth or ever thou hadst formed the earth and the world, even from age to age thou art God." This is also sometimes translated even from everlasting to everlasting thou art God. The translation from age to age, is more literal. Furthermore, the term "day of the Lord" in Scripture also involves a period.

Under the circumstances it is a small wonder that our Reformed fathers present several interpretations of day in Genesis 1.

Bavinck and Aalders take day in Genesis I as a long period for all the six days of creation. Kuyper takes the first three days as periods and the last three days as ordinary days, after the sun and moon were made to indicate days and seasons and years. Berkhof takes all six days as ordinary days. And Berkhof, Kuyper and Bavinck interpret Exodus 20:11 accordingly, each in line with his respective views of Genesis, chapter one. Such differences of view also appear in other denominations. Thus the exegetes cast the problems of chronology in our lap and put us still further on our guard against jumping to hasty conclusions. It is not necessary to bring these matters to a showdown. The supernatural character of God's creative activity is more important. But if we are warned by the Scriptural indicia to be on our guard concerning the chronology of Genesis 1, we are also put on our guard by the Scriptures concerning the chronology of the genealogies. The New Testament casts light upon these genealogies of the Old Testament. The New Testament adds a link to the O. T. genealogies and occasionally subtracts several links. The New Testament adds the link Cainan, in Luke 3:35 and 36: "the son of Shelah, the son of Cainan, the son of Arphaxad."

But this Cainan is not in the record of Gen. 11:12 which reads as follows: "And Ar-pachs—had lived 35 years and begat She-lah." Here the middle link Cainan is missing. Cainan is the missing link, here, in the Hebrew of Genesis 11:12. But in the Greek Old Testament, the Septuagint, this Cainan is found, and again in Luke 3:36. The Septuagint probably added the name from some ancient source. But the inspired record of Luke 3:35 and 36 leads us to respect that ancient source as correct on this score. And so we get with Luke 3:35, 36, "The son of Shelah, the son of Cainan, the son of Arphaxad."

But when the O. T. tells us that Ar-pachs—had lived 35 years and begat Shelah, while the New Testament has Cainan as Arphaxad's son and Shelah as his grandson, we come to the conclusion that Ar-pachs-had lived 35 years and begat Shelah's ancester Cainan. who according to Luke 3:35, 36 is the son of Arphaxad.

Thus the inspired text of Luke 3:35 and 36 shows that Genesis 11:12 omits at least one link in the genealogy. And if one link is omitted more links might be omitted, as is frequently done in the New Testament. For instance Matthew 1:8 omits three links at once. There we read: "And Joram begat Uzziah." But the three genealogical links Ahaziah, Joash and Amaziah are omitted here by Matthew. In other words when Matthew 1:8 says: "And Joram begat Uzziah", we must interpret this, in the light of the O. T., that Joram begat Uzziah, his grandson's grandson.

Thus the historical style of the Scriptures permits of the principle of omission in genealogies, both in the O. T. and in the N. T.

And thus we cannot follow Usher's chronology but the genealogies allow for gaps chronologically, even vast gaps. Though the ancient Hebrews may have known more about these patriarchs than we do, the Scriptures are very economical in the historical references to most of the genealogical links that are indicated.

And so we come to the conclusion that chronologically there may be many years that are not indicated in the genealogies. Raven suggests that the Scriptural age of the father in the genealogies when he begat a certain son, really means the age of the father when he begat either that son or an ancester of that son. At any rate we are put on our guard by the Scriptures of the O. T. and the N. T. themselves that the principle of omission obtains in these genealogies. In fact there may be very many missing links, besides Cainan, in Genesis 11:12 and Ahaziah Joash and Amaziah in Matthew 1:8. For the words beget and bear, like the words, father and son, are used with far more elasticity in Hebrew and Greek than in English.

Thus the elasticity of the genealogies allows for the chronologies of the Assyriologists, the Egyptologist and the students of Carbon 14, as far as the age of man is concerned. Though 10,000 years, for the age of man, might satisfy all these scholars, we should not let them do our exegetical work for us. We might better remain somewhat non-committal on this score.

But how about the age of the animal and the vegetable kingdoms? The elasticity of the word "day", in Genesis 1, again allows for the 20,000 to 30,000 years approximately involved in the dating of artifacts by Carbon 14. some 20,000 years for the animal kingdom and some 30,000 years for the vegetable kingdom.

Now we do not have perfect agreement in our Calvin College Faculty in these matters. Dr. John De Vries, one of our professors in Chemistry, has given attention to the structure of the atom, to the heavy elements and to Carbon 14, in his scientific and in his popular lectures favoring long periods for Genesis 1.

However, Dr. E. Y. Monsma, one of our professors in biology, does not favor long periods for Genesis 1, but ordinary days. But even our ordinary days have some elasticity: the longer the light, the longer the day.

I have audited six semester hours with Dr. J. De Vries in which he discusses such matters for our pre-seminary students. The text-book and the lectures are concerned with Chemistry, Physics, Geology and red-shift in Astronomy, in a semi-popular way. I have also read the long monograph of Dr. E. Y. Monsma, on the problems involved, in his interpretation of the days of Genesis one as ordinary days.

Both of these scholars would like to bring the matter to a show-down. We theologians and Hebrew linguists love to watch that battle from a distance, like the battle between Ford and Chevrolet, without getting too much entangled in it.

We Protestants will do well to refuse to be arbiters in such matters, at least not ecclesiastically. The Roman Catholic church tried to be an arbiter in the field of natural science concerning the movements of the sun and the earth, but we Protestants should have more respect for the Scriptures and less respect for ecclesiastical tradition than the Catholics. And the Scriptures themselves allow for ample elasticity in such scientific matters, as we have seen.

This does not mean that the Scriptures allow for theistic evolution, unless the word evolution is used in a non-technical sense. But evolution in the technical sense allows for no miracles in Genesis 1, and the exegete sees miracles, sees the supernatural hand of God, in Genesis 1. Both Dr. J. De Vries and Dr. E. Y. Monsma have no hesitation at the supernatural,—we are happy to say.

The exegesis of Dr. Aalders tends more to the views of Dr. J. De Vries than toward the views of Dr. E. Y. Monsma in these matters, both with respect to the heavy elements and with respect to Carbon 14. This is especially clear from Dr. Aalder's large volume on Genesis Chapters I, II and III, which I have here. And this interpretation is in the tradition of Bavinck rather than that of Kuyper or Berkhof. All three traditions have been acceptable in our Christian Reformed

circles, for decades.

These exegetical traditions are all linquistically possible, in the light of Genesis 1, and of the rest of Scripture. There will remain exegetical predilections, but these cannot be brought to such a showdown that any one of these three Reformed traditions would become exegetically and linguistically contraband. If that were possible, somebody would have been deposed long ago for deviating from Scripture, in denominations like the Christian Reformed Church and the Reformed churches of the Netherlands and of South Africa, where adherence to Scripture is emphatically required, by our Confessional standards.

The tentative efforts that have been made in the American Scientific Affiliation to align recent scientific studies with the six days of Genesis 1 are appreciated by us without our attaching finality to such exegesis. We refer to the articles by Peter W. Stoner and by Edwin K. Gedney, and others, in "Modern Science and Christian Faith."

And more of such exegesis would be appreciated, again without attaching finality to such interpretations. For the exegete must keep such interpretations at a distance, while appreciating them, because the exegete has to interpret Scripture in such a way that he maintains the elasticity which is inherent in the linguistic data of Genesis.

The Hoover Commission and its friends feel that it could save Uncle Sam about 2 billion dollars, and the Chemists and astronomers feel that they too can estimate the age of the universe at about 2 billion years, 2 to 4 billion. Well,—what is a little matter of an extra two billion between friends? At any rate the Hoover Commission has made some progress with its problems, and the chemists and astronomers have also made some progress. Some men will go off the deep end at this progress, others will be as guarded as Calvin Coolidge, and as Calvin College. But since not all the brethren here are Calvinists, I would like to add that we have many an Arminian offering, a perfectly free will offering, in our churches.

The geologists also include men of guarded statements. For instance Baron De Geer was very guarded about the age of the tertiary layer, when he addressed the American Philosophic Society. This noted Scandinavian geologist has written several books on geology, has made important geological surveys in the old world of Europe and in the New World of America. He lectured at various places in America in 1921, and after his lecture before the American Philosophic Society meeting in Philadelphia he was asked by Professor Morris Jastrow about the age of the tertiary layer. He answered that young geologists frequently gave high figures but these were only guesses, and then he sat down. But Dr. Jastrow was not satisfied and asked him for his opinion. Baron De Geer arose and answered that he had no opinion for it would be only a guess and sat down again. Dr. Jastrow got up again and said that now we understood that he could give no opinion but only a guess, and what would his guess be. Baron De Geer got up and said in substance that he guessed that 25,000 years would cover it. Well, this illustrates that some geologists are more guarded than others and that at any rate there is elasticity of opinion.

Such elasticity of scientific opinion is also evident from the many monographs available concerning the finds at the LaBrea pits of Southern California. These finds not only include the bones of many prehistoric animals, but also a human skull. And the monographs about these finds were on display at the Los Angeles County Museum, where a huge collection of bones is on display, together with restorations of sabre-toothed tigers and of other prehistoric animals. These animals had been regarded by scientists as of a much higher antiquity than the age of the human skull. And many controversial monographs resulted, concerning this find and similar finds elsewhere, tending to date such pre-historic animals down to the age of man. Carbon 14 also dates animal life back to something like 20,000 years, and vegetable life back to something like 30,000 years.

Meanwhile in the light of the heavy elements, the radio-active elements the inanimate world is regarded as from 2 to 4 billion years old. And the red-shift in astronomy leads to about the same age for the inanimate world.

Now what shall we say to all this, as exegets? There is one commentator that accepts such results. This is Dr. G. Charles Aalders, in his work on the first three chapters of Genesis, which I have here. He taught for many years at the Free University of Amsterdam. But his views have not convinced our Prof. E. Y. Monsma of the Calvin College biological department.

We prefer to rob the word day in Genesis chapter one, of none of its elasticity for the Scriptures have not defined that term here.

Aalders De Goodedyce openbearing in de Eerste die loofd stichken van Zenesis. The Divine Revelation in the first three chapters of Genesis. p. 256. "Thus, for instance, because of the side mentation, in the oceans, the estimate led to an average of not less than 90 million years." p. 258. Meanwhile, to all this uncertainty there now seems to come an end through the discovery of the phenomenon of radio-activity. The element uranimum (and similarly the element thorium) has a remarkable property, that it is slowly but surely disintegrated, so that the atoms out of which it exists, out of itself, without the activity of any discernible outside cause, are broken down, page 259. And the age of the earth, as a firm mass, is placed, in this way, at an amount of years that in any case lies in the neighborhood of 16,000 million, page 228. We have to do here with distances which range from 850,000 lightyears to 140 million lightyears.

As to the red shift in astronomy, and the expanding universe I find nothing in Aalders, nor anything with regard to Carbon 14.

The seventh day becomes the Sabbath. And the Sabbath was made for man.

Meanwhile Bavinck and Aalders, as we have seen, point out that we do not read of evening and morning with the seventh day. And they use this argument from silence for their position that the seventh day, is a long period, as it occurs in Genesis II.

However we read here that God finished his work on the seventh day.

He truly finished his work of creation by the blessing and hallowing of the seventh day and by this kind of resting.

But some of the ancient versions read here that God finished on the sixth day instead of the seventh. The more difficult reading of the Hebrew is however generally regarded as the better reading.

It surely is more difficult, and the difficulty increases when we consult the history of the earth given by geology. Suppose, for the sake of argument that we assume with Bavinck and Aalders that the seventh day is a long period, continuing into the future.

Is there then any connection here? In other words, does this finishing on the seventh day imply supernatural acts of God which can be recognized in the history of the earth given by geology?

The Impact of Geological Dating Upon the Interpretation of Biblical Chronology

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What impact has geologic dating upon the interpretation of Biblical Chronology? In the last few days many of you gentlemen, who should know much better than I, have indicated that it is slight; that aside from the lengthening of a few gaps in the chronologies, no alternations have been necessary. In so far as this is true it is indeed excellent. It is a sign of the accuracy of Evangelical theology. However a highly vocal, even if not large group, labelling themselves all things from theologists to geologists, have arisen to denounce geologic dating and geology itself as tools of the Devil which are seeking to destroy our faith in the Bible as the word of God. I haven't heard such a view expressed here so I won't waste your time trying to refute it.

Instead I would like to discuss briefly the theories and techniques of geologic dating. I do this not because the techniques are in themselves of especial importance to Christians, but because the results gotten from them seem to bother some. If this were not so I'm sure that this subject would not have been put on the program.

Let's consider first the reasons why the study of geology convinced men of the great antiquity of the Earth long before good quantitative methods of calculating its age were available. Then lets consider the nuclear physical data and geologic relationships upon which geochronology is based, and finally the degree of respect which theologians should give to geologic data when setting forth their interpretations of Biblical data.

The first thing that men had to learn, before they could appreciate the antiquity of the earth, is the fact that the earth, rather than being static, is undergoing continuous change. It is not a dark, dead sphere of rock. It is a pulsating body filled with an enormous amount of energy. This energy is slowly pushing forward processes of immense magnitude, changing continents into seas and seas into dry land. Earthquakes, volcanic eruptions, erosion, and sedimentation are manifestations of this energy.

Let's consider one example of this activity, a process involving great magnitudes of space, mass, and time. Vast quantities of material are being eroded by the Mississippi, its tributaries, and parallel streams. This material is ultimately carried down to the mouths of these rivers and deposited as sediment along the Gulf Coast. Measures of the rate of sedimentation off the shores of Texas, Louisiana, Mississippi, and the other Gulf Coast states indicate average rates of deposition of much less than a few inches per year. Yet exploration by oil companies has shown that the deposits are as much as 28,000 feet thick. The structures and textures within these rocks are the same in the deeply buried beds as in those at the surface indicating that all formed even as they are forming today. Great periods of time must have been required for their accumulation. The nature of sediments indicate that the floor of the basin has slowly and continuously sunk while the sediments have been piled on top of it. Yet the Gulf of Mexico is but one of many such basins which have existed at one time or another during the history of the Earth collecting millions of cubic miles of sediment.

Such rocks as these now seen forming along the Gulf Coast and in other sedimentary basins are found all around the earth. Some are still soft and uncompacted but most are consolidated into hard rock though still maintaining the same structures and textures as the soft sediments. Some are partially or largely recrystallized with loss of many of their original textures and some are completely recrystallized so that all, or almost all, primary structures are obliterated and their original sedimentary character is more inferred than observed.

Detailed studies of such masses of sedimentary rocks have shown parallel sequences in neighboring localities both in lithology, that is in the chemical composition and phyisical nature of the rock, and in their fossil content. These have permitted age correlations of beds in sections measured at different localities. Lithologic correlations are good only over short distances since they depend strongly on uniformity of environmental conditions during their deposition. However they do serve to substantiate the validity of parallel correlations made by use of certain fossils, or better yet, certain groups of fossils. Certainly not all age correlations made on these bases have proven to be correct, but experience shows stratigraphers which criteria are valid and which are not. Those which don't work are eliminated from stratigraphic methods. And let it not be thought that the validity of stratigraphic correlation by means of fossils in any way substantiates the theory of evolution any more than that of progressive creation or perhaps even modification of first creation. As with all scientific methods stratigraphic correlations and sequences cannot be applied without good judgment and adequate testing by the researchers.

Interspersed among the sedimentary rocks are igneous rocks which have formed by cooling of lava or magma, that is, fluid rock melts. Some have formed at the surface of the earth by extrusion from volcanoes or fissures, while others such as the feeders to volcanoes cooled and solidified below the surface.

The interrelations among the sediments and igneous rock units cutting across them or interbedded with them have been of great usefulness in working out the history of the rock sequences at many localities.

Deeper within the crust of the earth where higher temperature and pressure prevail, recrystallization of both sediments and igneous rocks has taken place. These processes are only relatively recently beginning to be understood in any detail.

Careful study of the rocks at many localities around the earth, using all methods of investigation available, has permitted the construction of a geologic history of the earth in general and of more detailed histories for multitudes of particular regions.

Our understanding of geologic history, to be sure, contains many gaps and uncertainties. Then, too future discoveries will doubtless necessitate many alterations and amendments. However the tremendous weight of factual evidence already available, and now serving as the foundation upon which the history has been built assures us that by and large the present history must be correct.

Studies of earth history show that tremendously long time periods must have been required for all that has taken place. An example is found in the petrified forests of Yellowstone Park where successive fossil forests are found, one above the other, where each has grown, been wiped out by volcanic ash, where the ash has weathered into soil at its upper surface, where another forest has grown only to be wiped out by another ash fall, and so on through several cycles. Yet these beds involved represent but a tiny fraction of the geologic column.

Thus a study of geology gives us the order of magnitude of earth history but doesn't give us good quantitative measurements. For such measurements geologists have turned to determinations of the radioactivity of rocks and minerals.

The phenomenon of radioactivity has been known and studied for almost 60 years but it has only been efficiently applied to geologic dating rather recently.

Radioactive decay results from an attempt by energetically unstable nuclei to reach a condition of greater stability. This is usually achieved by ejection from the nucleus of particles of matter or quanta of energy.

Much careful study by physicists has proven that the total activity of a radioactive isotope is directly proportional to the amount present. This decay can be expressed mathematically by a relatively simple differential equation containing one constant. The value of this constant, which may be expressed as the "half life" is different for each radioactive isotope and depends upon the particular energetics involved in its decay. The half life is the time required for half of any original amount of the species to decay. Thus Carbon-14 has a half life of 5580 years. That is, if I have one pound of C-14 today, in 5580 years only ½ pound will be left. The other half pound will have decayed to Nitrogen-14. Half lives range from those which are extremely long, such as the 62 billion years of Rubidium-87, to those which are extremely short, as the three ten millionths of a second of Polonium-212.

Typical decay schemes are shown by two radioactive isotopes important in geologic dating: Uranium-238 and Rubidium-87. Uranium-238, the most abundant isotope of uranium, has a half life of 4.5 billion years. It decays by the emission of an alpha particle to Thorium-234. This is itself unstable and has a half life of 24.5 days, decaying to Protactinium-234. The protactinium decays to Uranium-234, this is to Thorium-230, and so on until finally lead-206 is formed. This isotope is stable and will increase in amount as the Uranium-238 and the 16 intermediate products forming from it decay.

Rubidium-87 has a simpler decay scheme going by

Beta particle emission to strontium-87, a stable isotope. As previously stated this decay has a half life of about 60 billion years.

To measure the age of a rock or mineral one generally needs to know only the amount of a radioactive species in it, the amount of the daughter product which has been formed by its decay, and the rate of this decay.

The amount of the isotopes present may sometimes be measured by standard methods of chemical analysis but frequently mass spectrometers are used for determinations of isotope ratios of an element, and Geiger counters, scintillation counters, and other instruments for measuring radioactivity are used to determine the amount of a radioactive species present.

Ideally only minerals which contain none of the daughter product as a primary constituent should be dated. Daughter product initially present will make the mineral seem older than it really is. Thus Rubidium-87 ages are measured only for lepidolite and biotite micas which have negligible content of the strontium daughter. Potassium-40-Argon-40 ages and Uranium-Helium ages can be run on any mineral or rock since the argon and helium are gasses and are not included as primary constituents in rocks in measurable quantities. Similarly the best Uranium-Lead ages are gotten from minerals low in initial lead content.

Sometimes however mass spectrometer anlaysis permits corrections for initial daughter content and permits ages to be determined from minerals such as uranium ore containing primary lead. The isotopic composition of the primary lead may be gotten from associated lead minerals and this may be subtracted from the lead content of the uranium mineral. Ages from such minerals, however, seldom give as good precision as ages from lead-free minerals.

Another problem for the geologist measuring ages is the possibility of loss of daughter product during the history of the rock, giving ages which are too low. Thus argon formed from potassium decay and helium formed from uranium decay may leak out of a rock. Similarly either parent or daughter species may be leached out of the rock late in its history giving a spurious parent-daughter ratio, and hence an incorrect age. This is an especially important problem in lead-uranium age work.

These and similar problems must be overcome by the geochronologists. Their net result is to reduce the number of possible age methods which can be relied upon. Thus the Uranium-Helium method is practically defunct. The most recent trend in geochronology has been the measurement of single rock bodies by several methods to gain intercalibration. Results have been excellent, showing which methods are dependable and which have flaws, and what the nature of the flaws are.

At this time the uranium-lead method is considered the most reliable for dating rocks. Since uranium 235 decays to lead 207 and uranium 238 to lead-206, this method offers internal checks. The uranium-235, lead-207 ratio, the uranium-238, lead-206 ratio, and the lead-206, lead-207 ratio vary independently of each other. Rocks which give the same age by all three are considered reliably dated and are used as standards for the other methods. The potassium-argon method offers considerable promise for future work because it has shown good correlation with uranium-lead ages from standard localities and because potassium minerals make up a large proportion of the earth's crust. Thus geochronology is expanding and taking on new versatility.

Another age method, probably of greater popular interest than those thus far discussed, uses carbon-14. This isotope has a relatively short half-life compared to the age of the earth, and is, therefore, not useful in measurements on rocks, or, in fact, on any materials more than about 30,000 years old. However it is important in the dating of many archeological materials and very recent sediments. Because of its short half-life no carbon-14 formed at the creation of the universe, which apparently took place about 5 billion years ago, could now be detected. However cosmic ray bombardment of nitrogen in upper atmosphere produces carbon-14 as one if its products. This radioactive carbon is chemically the same as stable carbon and so is taken into the carbon cycle of the atmosphere, hydrosphere, and biosphere. All carbon in this cycle, such as carbon dioxide in the air, carbonate in near-surface sea water, and carbon in the organic compounds of plants and animals, has, within a per cent or so, the same content of this isotope.

When something is removed from the carbon cycle, such as when a plant or animal dies and is buried or when carbonate precipitates from sea water to form sediments, it ceases to receive carbon-14 into itself and that which it contains slowly disintegrates at the half-life of 5580 years. Thus the carbon-14 content of the carbon of an ancient tree-trunk or sea shell is a direct function of its age, and by measuring this content we may determine its age.

As with the other dating methods, so this one contains many sources of possible error. Contamination is a constant worry and a blunder in interpretation by a geologist or archaeologist can't be overcome by even the most expensive geiger counter. But these sources of error are known and constant care taken to eliminate them.

As we all know, geologic age determinations and even geology itself have been attacked by many of the hyperorthodox as invalid because they fail to uphold one or another interpretation of scripture. Numerous arguments have been brought forward to implement this attack. It is worthwhile, therefore, to discuss some of the possible errors in geochronology. First, however, it should be realized that attacks on the whole

body of geology by the so-called "Flood Geologists" and those with similar ideas are pretty futile. Similarly theorizing by some that the laws of nuclear physics aren't really valid are rather hopeless. One might as well tell the engineer that his theories are all wrong and that automobiles can't possibly run or airplanes ever fly. Geology does work and nuclear physics does work. Eighty-five per cent of this country's geologists are employed by the oil industry not because that industry wishes to discredit somebody's interpretation of Genesis One, but because the geologist can tell the oil man where best to look for oil. He can do this because the principles of orthodox geology give right answers when properly applied. Similarly anyone doubting the validity of nuclear physics must consider the successful development of the atom and hydrogen bombs to be sheer luck. Such views seem to me little more than wishful thinking.

However, as with all scientific measurements, those of geochronology are subject to statistical errors and to errors of interpretation. The half-lives of carbon-14, uranium-235, and all other radioactive isotopes used in age determination must be measured. These are determined by nuclear physicists using the best techniques available, but the job is a difficult one and accuracies better than a per cent or two are hard to achieve. Similarly measurements of the radioactivity of a sample by standard counting techniques or of isotopic ratios by mass spectrometry may be accurate only to within a per cent or so of the true value. Similar statistical errors are unavoidable in other steps of the determinations. However these could only change a calculated age by a few per cent at most, and an age of 500 million years is scarcely different than one of 515 million.

More serious errors may be made in the interpretation and application of data. If uranium has been leached out of a mineral by circulating groundwater a uranium-lead age determined from it will be erroneous. Similarly if a proper correction is not made for primary lead deposited in a mineral when it crystallizes, even the most precise measurements made on the specimen will give the wrong answer. Many similar errors are possible, but workers in the field are well aware of them and are continually checking, rechecking, and crosschecking to be sure that they don't fall prey to them.

Another stimulus for the control or elimination of errors is the spirit of competition among the various laboratories engaged in geological age determinations. Each laboratory is only too eager to discover and pounce upon mistakes made by another lab. When something is agreed upon by all you can be quite sure that the evidence is very strong.

It may be safely stated then that the methods of geochronology have been well tested and have been found to work. Certainly they aren't perfect or inerrant but then no one claims that they are. They are a useful tool in the deciphering the history of the earth, and that's all that they are meant to be.

A few sages have chosen to argue against geochronology on the philosophical rather than the physical level, opining that extrapolation of present day physical laws back into the past is invalid, or that God created the earth with a history built into it. Certainly the first view leads logically to the second because of the orderliness of the geologic history discovered when backward extrapolation of today's physical laws is made.

Since this is primarily a philosophical question I won't attempt to discuss it here, but I do think that we must decide whether we believe that God, in letting us study His Creation, is trying to mislead us into unbelief or is showing us the grandeur of His Works. I think, that as Christians, we may only believe that He is showing us His Greatness and Majesty to increase our reverence and love for Him. "Speak to the earth, and it shall teach thee. Who knoweth not in all these, that the hand of Jehovah hath wrought this, in whose hand is the soul of every living thing, and the breath of all mankind."

How much then should the theologian be influenced by geochronological data relavent to his interpretations of scripture? I believe he should give it weight equal to that given to data from his own field of investigation. The exact amount of weight given, of course, depending on the precision of the measurements made and on the validity of the interpretations made from the measurements. Such judgments are not always easy to make of course, but careful study of reports almost always gives adequate information.

The Unity of the Race: Genesis 1-11

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Recent investigations and interpretations have focused anew attention to the proper exegesis of Genesis 1-11 as it affects the question of the unity of the race. This passage is the introduction to the written revelation which God has left to mankind and very briefly surveys for us the beginning of all things. As far as the human race and its beginnings is concerned we do well to re-evaluate the question whether or not the whole human race is included throughout this introduction.

In order to limit our discussion as we focus our interest on this question we suggest that we assume first that all mankind descended from Adam and Eve as Paul[1] asserts that God "made of one blood all nations;" second, that a careful exegesis does not state whether or not the flood was universal; and third that the geneologies given in chapters 5 and 11 do not necessarily give us a complete chronological account so that we may not be able to estimate accurately the time included in this introductory passage. With this as a common ground for our investigation we suggest the following propositions, first, that God created men as a moral being, second, that all moral beings were involved in the flood, and third, that the whole human race was included in the covenant God made with Noah.

Man Created As a Moral Being

In the opening chapters of Genesis that describe the beginning of the universe and all related things the climactic act is the creation of man. All things up to that point were made for men; after that creation all things revolved around man and his descendants.

When God made man we are plainly informed that man was made a *nephesh hayah* or "living soul". This term is applied to land animals and marine life in this account.[2] Theistic evolution suggests that in the process of creation God may have used animated dust or animals to make man.[3] It is significant to note that when God breathed into him the breath of life he became a *nephesh hayah*. This implies that man was not animal before God acted upon the dust used in creation of man. Additional statements however indicate clearly that man was also made in the image of God which is not the case in the creation of animal life. Within the limitations of this discussion we will not engage in a definition of "the image of God in man" but simply note that this distinguished man from the animal life existing at that time.

Man also appears as a fully developed being with intelligence and ability to name the marine and land animals about him, Genesis 2:19. Not only was he to name them but was given charge over them so that the animal world was to live in subjection to him. He was endowed with the ability to rule and use the animal as well as the vegetable kingdom for his own good. Man is set apart at creation as distinct and superior to all about him.

We also observe that man carefully examined all the animals about him but found no one his equal.[4] Not one of the animals was capable of fellowship with Adam. When God observed man's loneliness He created Eve as an helper or mate. Here the institution of marriage is instituted. Jesus in Matthew 19:3-6 as well as Paul in I Corinthians 6:16 appeal to this passage in Genesis 1:24 as the basis that man has a moral responsibility in marriage. It is important to observe that man had this moral obligation before the fall.

It has already been pointed out that man was entrusted with responsibility. In Genesis 3 the facts clearly indicate that Adam and Eve are morally responsible to God to obey Him. They are placed in the garden with the condition that they conform to the explicit commandment of God. This again distinguished man from the animals; none of the animal kingdom except man were held morally accountable to God. If the curse affected the animals it did so because of man's sin, since the ground was cursed for man's sake.

Since man was a moral being he was punished for his disobedience in being expelled from the garden of Eden. As a moral being he was capable of redemption. God did not leave him without a hope but gave man the promise of redemption so that Adam and Eve with their descendants had a hope as they were subjected to the consequences of the judgment that resulted from their sin. God continues to deal with man as a moral being as the following developments clearly reveal.

Thus we observe that the creation account in its brevity distinctly sets man apart from the animals about him; created in the image of God man has a moral nature that makes him capable of being accountable to God as a moral being.

All Moral Creatures Were Involved In the Flood

Man created by God was the center of interest in the whole account of the flood as given to us in Genesis. An intelligent interpretation and exegesis of this passage should take this into account as it affects the unity of the human race as well as the details in this record.

As the destruction of man is announced in this narrative we read, "And the Lord said, I will destroy man whom I have created from the face of the earth; . . . .[5] Man was God's creation that He had endowed with life. So far the Genesis account has indicated the

creation of Adam and Eve and their descendants; here man is spoken of in the generic sense referring to to the race as a whole. In the opening statement of this flood record it is clearly indicated that man or the human race began to multiply. As the human race increased with that came the increase of sin and wickedness which precipitated God's displeasure. There is no indication here to warrant the possible conclusion that only part of mankind was involved. It was the human race that multiplied that became sinful. It was the human race that multiplied and became sinful with whom the spirit was striving. It was this sinful human race concerning whom God said that He would destroy them. The degeneration of sinful humanity caused God to grieve and repent that He had made man. No principle of exegesis allows for an exclusion of any part of the descendants of Adam and Eve except as is indicated in the context. Thus when God states that He will destroy man whom He has created it involves the whole human race.

By contrast the exceptions to the case are minutely stated. At first only Noah is mentioned in the text as being excluded from judgment.[6] Further elaboration specifically enumerates Noah's family.[7] New Testament confirmation agrees with this when Peter states that Noah was saved when God brought the "flood upon the world of the ungodly" II Peter 2:5. In his first epistle Peter has already made reference to the fact that eight souls were saved in the days of the flood I Peter 3:20. Thus Noah and his family are the only exceptions mentioned in either testament that were not included in the judgment that God sent upon the human race in the sending of the flood.

Moral beings were primarily involved in the flood. Although animal life is destroyed reasonable and sound exegesis of this passage would not necessarily require that "all" animal life perished in the flood. Animal life was affected and undoubtedly was destroyed for man's sake as God's purpose was accomplished in bringing judgment upon the human race.

In this passage the word "flesh" or Hebrew word *basar* is frequently used. It has various meanings and uses according to the Hebrew lexicon in this account.[8] Frequently in the flood story it refers to all living creatures that were destroyed. In Genesis 6:3 we read, "My spirit shall not always strive with man, for that he also is flesh." In the creation account it is specifically stated that God made man a *nephesh hayah* even as the animals but the context uniquely set him apart from the animals as a moral being responsible to God. Here God declares that man fails to respond to the spirit and in that he is like the animals or flesh. Destruction of man's physical being is essential so that his moral privilege of resisting the spirit will be terminated. Again in Genesis 6:13 the word "flesh" has the same meaning referring to the human race where God says, "The end of all flesh is come before me; for the earth is filled with violence through them." It was not animal life as such that filled the earth with violence but man who had a moral relationship with God. Nor could the earth itself be filled with violence for the preceding verse says, "And God looked upon the earth and behold it was corrupt; for all flesh had corrupted his way upon the earth." It is "flesh" or man who corrupted the earth by resisting the spirit. Man as a moral creature precipitated this judgment and for his sake this judgment came.

Frequently in this account the word "flesh" refers to man as well as beast. When God assures Noah that He will send a flood to destory "all flesh" it is primarily directed against man since the animal life is not mentioned when the flood is announced; a moral issue was involved between man and God; since animals are not moral they are not mentioned in the introductory paragraph. However, as man is punished animal life perishes as well and so is frequently mentioned in this record with man being included in the term "all flesh."

The word "all" is used in many ways in the scriptures. Many examples could be given where it is limited in its meaning.[9] This passage would justifiably be interpreted with a limited "all" so that not all animal life was destroyed in the flood. This can easily be illustrated in the context. In Genesis 6:7 we read that "every living thing (all) that is in the earth shall die" but later in 7:22 we note that this is restricted to "all that was in the dry land." The inclusion of the whole human race is not dependent upon the word "all" as used in this account. A sound interpretation of this passage makes it very clear that all moral beings were included since Noah and his family are the only ones that were singled out as being acceptable to God. The rest of mankind has corrupted the earth. On this basis the flood needed to extend only as far as man had multiplied so that animal life was destroyed wherever man was living when the flood came. In view of this interpretation of the passage as a whole the term "all flesh" in Genesis 6:12-13 undoubtedly included all mankind created by God except Noah and his family.

The Entire Human Race Was Included In the Covenant With Noah

A careful consideration of the covenant made with Noah suggests and implies the unity of the race in Genesis 1-11. This covenant is already introduced as Noah enters the ark and actually realized after the flood. (Genesis 6:18; 8:20-9:17)

The covenant made with Noah has many similarities to the commitment and charge God gave to Adam. Both were commanded to be fruitful, to multiply, to fill the earth, and to have dominion over the animal and vegetable world. Here however God assures Noah that no more will He destroy "all flesh" as He had done through the flood. This new beginning is not to be overshadowed by the possibility of utter destruction. As a constant reminder to Noah and his descend-

ants that God made this promise a bow was placed in the cloud as an assurance to "all flesh" that they would not be subjected to a destruction by a flood.

It should further be noted that this covenant was made with Noah and his seed. By contrast with "all flesh" that was to be destroyed (Genesis 6:17-18) God makes provision for the continuation of the human race through Noah and his descendants. Had any part of the human race survived the flood outside of Noah and his family they would not have been included in the covenant God made here. The implication seems to be that all mankind descended from Noah so that the covenant with its bow in the cloud as a reminder would be for all mankind.

As this covenant with Noah is compared with God's promise to Abraham it is apparent that either Noah and his family were the only survivors or that God completely ignored the rest of mankind. When God promises Abraham to make him a blessing God does this by selecting him and setting him apart from the rest of mankind. The race as a whole is not destroyed as was the case in Noah's day but is permitted to continue on in its sinful way. Here through Abraham, however, provision is made so that through him all the families of the earth will be blessed. In this way the whole human race is assured of blessing through Abraham, not only his seed. In the covenant with Noah provision is made for the seed or descendants only.

If God in Genesis 1-11 is considered to be the God of the universe, the God from whom all mankind came through Adam and Eve it seems reasonable that God would make provision for the whole human race. Should the God of this account be limited to a local being whose interest was only with part of mankind then allowance could easily be made for part of the human race to be entirely ignored in the account of the flood. Undoubtedly Genesis 1-11 is best interpreted as an introduction to the rest of scripture as a brief survey of the beginning of all things. A logical and respectable interpretation of the facts as they are set forth here point to the conclusion that God's primary interest in all His creation was man as a moral being. God continued in His relationship on a universal basis with all mankind until Abraham was singled out through whom provision was made to bring blessing to the whole human race. After this survey of developments of the whole human race the specialized history of the chosen nation begins through whom the promise of redemption was to be realized.

FOOTNOTES

[1]Acts 17:26

[2]Cf. Genesis 2:7-man; Genesis 1:24-land animals; Gen. 1:21 -marine life; Gen. 1:30 and 2:19 *nephesh hayah* applies to both.

[3]Strong, Augustus Hopkins, *Systematic Theology*, Judson Press, 1907, pp. 465ff.

[4]Genesis 2:20.

[5]Genesis 6:7. Here note the use of the article with *man* meaning the whole race—not one man.

[6]Genesis 5:8

[7]Genesis 6:18 and 7:13

[8]See Brown, Driver and Briggs, *Hebrew and English Lexicon*, p. 142.

[9]Cf. Genesis 41:57; Deuteronomy 2:25; I Kings 18:10.

Racial Dispersion

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The tenth chapter of Genesis ends with a summary statement about the dispersion of the nations. No clear statement concerning races is here found, though racial information may well be contained in the chapter. Perhaps we need not be lengthy in drawing out such racial information as may be here given.

In approaching the chapter we would mention our assumptions which are the same as the views of the previous speaker—that the Flood of Noah was as wide in extent as the dispersions of man and that therefore all present men are descended from Noah and his family.

We need not adopt the view that has sometimes been expressed that the three sons were black, yellow and white. If they were so, what were their wives? Rather we would say that in these six people were all the genes which have separated out into the modern race. Ham could have been white and his wife yellow. Shem could have been black and his wife white, etc. Of details we know nothing. This would seem to be obvious enough unless some of the racial characteristics have developed by mutations of various kinds since the flood. And I believe there is some evidence against this in that some of the modern racial characteristics are apparently found in prehistoric man—as for instance negroid characteristics in the Grimaldi skeletons. Of course of the six individuals after Noah quite possibly none were pure white or pure negroid with color, physique etc. all associated in the way we visualize the races. Shem may have had the genes for kinky hair and yellow skin, Ham for white skin and Mongoloid eyes etc. But the genes we would have to say were all there whether in evidence in the body characteristics or not.

Now Gen. 10 does not claim to speak of races, but of nations and families and perhaps cultures. Race

is a physical term. The A.S.A. Symposium quotes Boas definition that race is the "assembly of genetic lines represented in a population" (p 105). With this in mind we are at a disadvantage in ancient racial studies based upon literary sources. Men were more often described according to language and culture than according to physical characteristics. Yet with limited success we may use culture and language factors to help to indicate races. Breeds of cattle are separated out by artificial selection. Races of men are maintained by a process of selective marriage occasioned by culture barriers. Quite possibly races originated by this same artificial selection factor. And one of these culture barriers is language. The person of foreign speech is a barbarian. One should not mix with such people. People of similar habits, culture, language will mate and continue a race in a higher degree of purity. These are not merely modern nor American prejudices. The word barbarian is Greek and expressed reproach for a speaker of a foreign language. The Egyptians had no dealings with Shepherds nor the Jews with the Samaritans. Race prejudice is apparently quite old and this is what preserves the races as unchanged as they are. Yet of course such race prejudice is often broken down. It is a human factor and does not infallibly work. We must therefore use language and culture as an indication of race in ancient times with due caution.

As to the study of Gen. 10, I would like to try to make one contribution to the study. Gen. 10 several times uses the word "begat." Canaan begot Sidon his firstborn and Heth and the Jebusite etc. In Gen. 11, the post diluvian geneology the word "begat" is used. But it is not often noted that these two words represent different Hebrew forms. And I believe they have different meanings. In Gen. 11 the form is the causative of the verb "yaladh" to bear. It could more properly mean "begat" or as Dr. MacRae put it "to become an ancestor of." It is so used of Abraham when he begat Isaac, etc. It is a genealogical term. The other form is the simple stem of the verb "yaladh" to bear. This is used in Gen. 10. It is regularly used of a mother bearing a child. When used with a masculine name as in Gen. 10 it would seem to speak of a general relationship not of a real ancestry. Interestingly, this is the form used of God the Father and the Son in Ps. 2. "This day I have begotten thee" does not mean I have today become your Father in any generative sense.

The conclusion is sustained by the content of Gen. 10 which is regularly called the "table of nations," Gen. 10:15 cay Canaan begat Sidon his firstborn, and the Jebusite and the Amorite etc. Rather obviously the latter terms are designations of national groups. The verse only means that the oldest or greatest city of the land of Canaan is Sidon and its other national inhabitants are Heth, Jebusites, Amorites, etc. Very few of these names need to be names of individuals. In some cases the clan ancestor may be meant. Often not. In Gen. 10:6 one of the sons of Ham is said to be Mizraim. This is the Hebrew name of Egypt and it appears to be a noun in the dual number. Hebrew has a singular, plural and a dual number used for pairs of objects. Early Egypt was born from a union of Northern and Southern Egypt and was celebrated as a union of the two lands. The king of Egypt wore a double crown. It seems clear that this son of Ham was never an individual. It apparently only means that Ham's children colonized Egypt, Ethiopia (Cush), Canaan, and Phut (possibly Punt in East Africa).

Canaan indeed in Gen. 9 may be presented as an individual from whom in some unspecified way the land of Canaan was colonized. But surely we shall agree that there is no justification for making Canaan the father of the negroes much less the source of an assumed curse on that race.

I should say before leaving this that higher criticism has long obscured the difference in verbs between Gen. 10 and 11 by calling them different documents each with his characteristic vocabulary. Also I should say that the antediluvian genealogy of Gen. 5 uses the causative term properly "begat" like Gen. 11; whereas Gen. 4 the genealogy of Cain uses the single verb and is a table of nations for the Cainites.

It follows that racial information from Gen. 10 will be gathered with caution. The races there are all mixed up. Ham is the general source of the Egyptians, but also for the Canaanites. Some of the Canaanites were Jebusites. The Jebusites of Jerusalem in later days bore names which identify them as Hurrians who spoke a language without known relation to Semitic, Egyptian or European. The Sidonians on the other hand spoke Phoenician, or Semitic language, at least at one stage.

The detailed identification of some of these names in Gen. 10 is difficult, tho some are clear. A number of these early names of Gen. also appear later in the Bible, tho it is not certain that the national group is unchanged. Early Tubal may be unrelated to late Tubal tho the area occupied may be the same—we sometimes speak of the Indians as the first Americans. Some suggested equations given by E. A. Speicer of University of Pennsylvania in classes are:

Goner—gimirai of Assyrians, Cimmerians of Josephus, related to Cymbri of Wales, the Celts whose language is somewhat related to Hittite.

Magog—possibly a form of the phrase Land of Gog not well known.

Madai—the Medes of Assyrian times

Javan—the Ionians an old tribe of the Greeks.

Tubal—a tribe in Cappadocia—E. Anatolis

Mesheck—Muski of Assyrian records near Phrygia (N. of Assyria)

Tiras—the Etruscans, or people of Troy.

Ashenz—Assyrian Ashinzi or Scythians.

Togarmeh—Tilgarimmeh a chief city in Tubal. More of these would be given but time does not per-

mit. Also some of these identifications are by no means sure. But they are presumably better than some current identifications with Moscow, Tobolsh, etc. because they are comparisons within a more or less related language and time horizon with careful phonetic correspondencies observed as nearly as we can with limited information.

One feature of the chapter may be worthy of notice. When it tells in vs 6-12 of the Sons of Ham it relates a colonization that reached from Cush (apparently Ethiopia) across the straits into So. Arabia and thence up into Southern Mesop and Northern Mesop. The tribes of Seba Havilah etc. are not sure, but seem to be So. Arabic. They send forth a hero Nimrod not otherwise known who colonized Babel, Ereck, and Accad in the land of Shinon. We know when these cities were founded. Shinar is the Hebraized name—accurately rendered for ancient Suner. It is not certain whether the first inhabitants were Sunerian or Semitic. The Sunerian language is unrelated to anything we know and the home of the Sunerians is unknown. If the earliest or at least early inhabitants were Semitic as they surely were soon after, then this movement would be a Semitic movement pointing to a home of the Semites in Arabia or even across the straits in Africa.

Bloomfield cautiously admits that the Semitic language connected with Egyptian and others in a Semitic-Hamitic family may be distantly akin to the Indo European (Language p 65) This would fit well enough the latter in Gen. 10, but much more than this we can't say.

We should not think that all the descendants of Noah are here detailed. Nor should we think that the author wrote about all the races that he knew. Negroes were well known in ancient Egypt as the pictures show. Phineas, who had an Ethiopian name, may well be one of these Negroes as might Moses' wife—an Ethiopian. Some of the people of Cush might be negroes in Gen. 10. Or the negroes may have been So. Egyptian group, not negro. Modern Ethiopians are not negroes.

A final suggestion is purely speculative. If we argue that all modern races have descended from Noah's family, we could also feel that there were races that entirely died out at the time of or before the flood. If all the cows in the world today were destroyed except a few pure bred Jerseys and Holsteins, there would thenceforward be no Angus, Guernseys etc. It is possible that there were pre-Noahic racial genes which were completely lost. It seems that the Carmel skeletons show mixtures of Neanderthal characteristics with those of modern man. Neandertheloids apparently interbred with others. If Noah's family happened to have none of these genes, the Neanderthal characteristics would have died out completely or of course they could have been lost in some other way by accident of climate etc.

Gen. 10 tells us of numerous nations that peopled the near East after the flood. All were descended from Noah's family. The list may not be complete and it is racially quite mixed up. We should not treat it as a genealogy, but it may be used to give some valuable information on early colonization.

Summary and Comments

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I was assigned a three-fold task. It was to endeavor to summarize the discussions to this point; to suggest some conclusions as to procedure from this point; and to bring a brief word of a devotional character.

Not all of us have been at the conference since its beginning. For those who have not, and for a review for the rest, let me present a resume of our work to date. Yesterday afternoon at the meeting we had presented to us the point of view of each of the two societies. Dr. Mason and I were supposed to have been there to answer the questions which might have arisen about the societies. I am glad you got your questions answered; even though neither one of us happened to be there!

I think I should here, in view of the conclusion that I would like to present a little later, refresh our minds on the purposes of these two societies. I note by the constitution of the E.T.S. that their purpose is very briefly stated in just one sentence. "The purpose of the society shall be to foster conservative Biblical scholarship by providing a medium for the oral exchange and written expression of thought and research in the general field of the theological disciplines, as centered in the Scriptures." As I understand it, Dr. MacRae pointed out very clearly yesterday that the purposes of the two societies (E.T.S. and A.S.A.) are quite different. The E.T.S. has as its purpose the meeting of minds and the exchange of ideas. The A.S.A., at least as it was conceived, and as it is expressed in the constitution, has quite a different purpose. I will read very briefly the purpose of that society, and then a few sentences from the story of the

starting of the society, so that we may see its purpose. The purpose of the society, "to integrate and to organize the efforts of many individuals desiring to correlate the facts of science and the Holy Scriptures. To promote and encourage the study of the relationship between the facts of science and the Holy Scriptures. To promote the dissemination of the results of such studies."

The purpose of the A.S.A., then, is not only to meet together to exchange ideas on scientific or Biblical items, but to bring together the product of the minds of the scholars in secular fields with the work of the exegete in the Biblical area. But it is more. The A.S.A. published its constitution in a small booklet together with the very interesting story of the founding of the A.S.A. I would like to refer to the start of this society and then read just a sentence or two from it . In 1941, September, for a week, a group of men met in Chicago to discuss the problems out of which this society grew. These men recognized a certain situation among students in colleges, particularly in colleges where the philosophy is a materialistic one, the problem of reaching those minds, nurturing them in the faith, and not allowing them to gain the impression that all scholars are agreed. I suppose that is oversimplifying it. "These men had all read books, pamphlets, and articles by Bible teachers which deal with scientific matters. Although the Biblical truths are presented in a commendable manner, some of the attempts to demonstrate the reliability of the Bible are shot through with inaccuracy, mistakes, and unscientific conclusions. . . Most of the authors are genuine Christians, but are either unprepared to write in the scientific field selected, or are definitely misinformed. . . . While to many of the lay public this may give a modern touch to the sermon and leave the impression that the speaker is well informed, to any college freshman a barrier is raised, which grows higher and higher with each succeeding similar incident. . . . How is it possible to help these authors, ministers, Bible teachers, evangelists, and college students? . . ." One more sentence: "This group of scientists can prove to the world that the principles of our Christian faith welcome investigation and that the Bible, being the Word of God and thus infallible, will withstand any encounter with science, which might be proposed."

To work on these problems was the reason that the A.S.A. was formed, as I understand it. The purpose of the A.S.A., then, is to study those particular areas where the harmonization of science and the Bible is not obvious, to try to determine the approach in these areas, and to determine the best presentation of the conclusions for the theologians in the use of that material in their pulpits and classrooms. Now, the fact that we have failed in accomplishing that purpose or have really only scratched the surface in accomplishing that purpose, I believe is highlighted by a book review of Dr. Ramm's *The Christian View of Science and Scripture*. I would like to quote the last part of that review. It brings rather forcefully before us the manner in which we as members of the A.S.A. have failed. In this part of the talk I address the members of the A.S.A. because, by their constitution, the E.T.S. does not have that as its purpose. In this joint meeting, however, we in the A.S.A. may have the advantage of the sum total of the exegetical and biblical and systematic theological ability of the theologians in furthering this particular aim of one of the two societies. The review to which I refer is from one of our most highly respected Christian publications. It illustrates the tremendous need for this aspect of the work of the A.S.A.: "Good old-fashioned Bible believers will be disturbed to see the confessions the author makes, including beliefs in the pictorial-day theory of the Genesis days." That review raises a question, whether Ramm has here made a concession or not. The author of this review considers it so. It may be, however, and it may not be. That should be one of the problems of this society. Ramm rejects the idea of a universal flood. That too may be bad or it may not be bad; some of our leading Christian scholars in this country have no particular problem in that area. But these are positive conclusions with which the particular reviewer happens to agree, and, presumably, it is the position of the journal which carried the review. The review to which I refer states: "It is the type of work that will be accepted and approved by some academically-minded theological seminary staffs and students, and rejected by the no less academically minded, but more Biblically-influenced Bible institutes and colleges." A very successful and bad wedge has been driven in an area in which it should never have been driven. I think perhaps it is the fault of the A.S.A., or at least that this Association has not been in operation long enough to make a successful impact, that such a conclusion can be expressed.

In accomplishing the purpose of the A.S.A. what may we do? There are those in the Association who feel that the best way to accomplish our purpose would be for us to pattern our society after such an association as, for example, the American Chemical Society. It would then be our principal purpose to read original papers of a caliber sufficiently high that no scientist could afford not to be present at our meetings or at least could not afford to miss the statements made at them if he desired to keep up to date in his area. I think that is a very worthwhile objective and I think it certainly one for which we ought to strive. Christianity will be clothed upon with a certain degree of respectability if those who are scientifically minded and who are scientists are able to make significant contributions in their own fields. That aspect of the work should certainly not be forgotten by either of these two societies. It is a very important and vital part. On the other hand, there is probably a larger

percentage of the members of these societies who consider the work of the societies largely a matter of fellowship and getting together for devotional exercises, and so on.

Both of those are important considerations. Neither one of them happens "to ring the bell" in terms of the expressed statement of the A.S.A. as it is expressed in the constitution and in the preamble to the constitution. There the problem is the consideration of problem areas as between various scientific fields and expressed statements in the Bible. It is to consider what advice we will be able to give the people who have to make pronouncements in these areas. So we have met together in the first of what I certainly hope, personally, will be only the first of many such meetings to try to arrive at some methodological conclusions. How shall we proceed to do this job which is ours in the area of faith?

This morning we listened to a group of theologians, (I am not making a distinction between the theologians and scientists, but, primarily, they were members of the E.T.S.) talking to us about the problems of interpreting the Bible. I am not entirely certain in my own mind that all of us reached right conclusions. I happen to believe that the right conclusion is that the interpretation of the Bible is a very big job. It is not something that can be put aside lightly on the pretext that the Bible is perspicuous. Certainly the Bible is perspicuous. But when you say that you really have not said a lot, and you have said nothing that relates to the area of our problem at this conference. The Bible is perspicuous relative to salvation. The Bible is perspicuous in many areas. The Bible is perspicuous about the resurrection of Jesus Christ and about the authority of the Scriptures today.

Let me take a very simple illustration. In the Book of Ruth she says, "Where you go, I will go, where you lodge, I will lodge, your people will be my people and your God my God: where you die, I will die, and there I will be buried: the Lord do so to me, and more also, if ought but death part thee and me." I am using my own private reading of the King James Version! The A.S.V. comes to essentially the same conclusion. The conclusion is that the only thing that will separate Ruth and Naomi would be the death of one of them. If you observe your King James you will see that the 'ought' is in italics, which means, obviously, that it is the interpreter's attempt to get that Hebrew idiom over into English. Supposing that we make the observation, which is correct for Hebrew syntax, that after the formula of an oath, a positively expressed statement is actually negative and vice versa. If I say in Hebrew, after an oath, "As the Lord lives, I will do so and so," it means I will not do it. The sense is "As the Lord lives, *if* I will do so and so." This is negative. Supposing that that is applicable in this case. There is certainly a formula of oath introducing the statement. Is Ruth then saying that only death will part them, or is she saying that death itself will not part them. Your God is my God, death itself, will not part us. Now here is a case where every Hebrew word is perfectly clear. The thing is perspicious, but there are two quite different conclusions reached. The theology that would come from it, is quite dissimilar. What was the theology of Ruth, relative to the after-life? In one case nothing is said. In another case a very clear statement is made. So when we say the Bible is perspicuous let us not be easily moved away from the position that the last word has not been said on most of the doctrines of the Bible. And when we say the Holy Spirit indwells me and therefore, we can make a pronouncement on this or that subject, let us think that through a little bit. Can every Tom, Dick, and Harry say what this or that verse means, categorically, on the pretext of the fact that the Holy Spirit could never make a mistake in leading the child of God? Well, presumably we wouldn't be Methodists, and Baptists, and Calvinists, and Arminians, and I don't know what all else, we just wouldn't be them if the Holy Spirit always made people think exactly alike. He does not do that. Therefore, it must be perfectly clear, and it is clear to me, that not everyone of us has the right to say about a given Bible verse, this is what it says. Certainly, the man who is not a specialist in the Greek language or the Hebrew language, and the Aramaic, ought to think twice before he makes some statements that he does make. The problem right here is an emotional problem. It is very difficult for us to leave our emotions out of our thinking. Because I happened to be born in this locality and reared in that particular church and went to that particular theological school I am emotionally involved with my system of theology. It is very difficult for me to leave that out, in any scientific consideration of verses of Scripture. I think one of the great victories in my life personally, was when I finally recognized the truth of that very simple proposition. But it is perfectly clear to me that it is a proposition that not everyone who writes for either E.T.S. publication or A.S.A. publication has actually thought through. We still find scientists making statements about the Bible that are naive in the extreme, and we find preachers making statements about science that even I can see through, and that is saying quite a bit since I am not a scientist. But that is our problem. The problem of leaving the emotional factor out in the calm, cool, deliberate consideration of something that may have vital implications for me in my whole ministry and in all my thinking. Which one of us does not want to be considered popular? Which one of us does not want to make an impression on the college students in our contacts or that come to our churches? So we make the kind of statement that the preamble to the A.S.A. Constitution refers to. Or the scientists make elemental blunders in interpreting the Bible. Far better for both to say, "I don't know,

that's not my field, let's look into it." But there is a tendency not to do that. If we can really come to the place where we believe that the problem of interpreting the Bible, and science, is one of major significance that can be entered into actually only by a skilled technician, then I think we will have laid a very excellent plank number one in the problem of the interrelationship of these two societies.

Dr. MacRae, in his address, made a very excellent transition between the presentation of the members of the E.T.S. in the morning and the presentation of the A.S.A. members in the afternoon. He presented the problem of the "hazy" question of Biblical interpretation versus the "facts" of science. (See MacRae article.) The ants reached wrong "scientific" conclusions because they did not have all the data although they thought they controlled it all. When we met in the afternoon, we were told that the facts of science could very conceivably have quotation marks around the word facts, and with parenthesis around it and with at least a small question mark. Then we were also told that there are certain definite restrictions on the application of the scientific method so that even the so-called assured results of man could be questioned and could, with changed environment, not be as they appear today. The end result was a certain confusion in all of our minds. It was expressed on the floor, I think, by one or two of the speakers. What we ought to conclude is that we all have problems, and that we all have the same problems. The problem of the theologian who tries to interpret the Bible is not one whit different, I believe, from the problem of the scientist who tries to take the data that he observes under the microscope, by the telescope, or in the test tube, and tries to draw conclusions that relate his data, and then tries to draw conclusions that relate those conclusions to other data, eventually expanding into the area of meta-physics, as the physicist does in certain parts of his field. So, we all have problems, and the problems I believe, are identical.

Methodologically what should we conclude? If you permit, I will use two very simple illustrations. I have said what I am saying tonight before, at least twice, at other A.S.A. or E.T.S. meetings. The situation still prevails, however. I am not Jeremiah, the weeping prophet, but I am repeating just a little bit, because I believe very firmly that a certain approach to this problem could be effective. The members of the E.T.S. could help us in reaching the objective of the A.S.A. Some years ago my son fell and broke his arm and we had to take him to the hospital. He was quite young then so "Pop" went in with him. He had a rather bad break, and it was Saturday afternoon. None of the resident physicians were in, and a group of interns took charge of the situation. I observed a very interesting thing. I had had some Red Cross training and remembered how they had trained us. They insisted that once you get traction on a broken bone, you must not let it go for any reason. Well, they had traction on and off my son's arm three times. They couldn't find a way to maintain that traction. Finally, I made a suggestion. Here I was, a preacher, an outsider, not a medical man at all, or a scientist, but I knew what they were doing was wrong. I observed to them, "If you'll do it this way, you will get a traction that will hold." But I was a preacher and they were paying no attention whatsoever. Then a foreign student who was interning there came in. He had a little more practical know-how than the rest of the interns and he came up with the same conclusion that I had mentioned a couple of hours earlier. They used that method and it worked. Well now, why weren't those interns interested in my observations as to how the job might be done? The answer should be obvious. Let me answer by another illustration. If I should take my wife down to the doctor's office, and go right into the doctor's office, and say, "Now look Doc, you're overlooking this, you're overlooking that, and since this is the case, therefore that's the result." Can you imagine what would happen to this preacher? Well, he'd get thrown out in a hurry. Yet, in some measure that is the way we are operating presently. If I happen to be a good blacksmith and something goes wrong with my watch and I go down to the watchmaker and I say, "Now mister, look! In my business, this is the way we do it. If you try that method, it would probably work with the watch repair business, too." Well! It wouldn't work! So then, what is our problem?

Once I taught a course in evolution and the Bible. That was twenty-five years ago, give or take a dozen years! I feel that I knew a lot about it. I majored in biology in college and they had trained me some place as a preacher so I thought that was all I needed to know. I sounded forth on evolution and the Bible. I thought I did a good job, and I still think I did a reasonably good job considering the tools I had to work with. I showed the mimeographed notes to Larry Kulp a few years ago. They came back all marked. I showed the same notes to Jim Buswell, an anthropologist, and they came back with all kinds of suggestions. After that I figured that this was beyond me. I decided that I had better let the experts handle it, and that I had better stick to my own knitting. I reached a very elemental conclusion. It was that there is an area in which I am vitally interested, but in which I am not competent at all. Then what is my feeling when I pick up an article by some scientifically trained person and find in it references to Biblical terms that are not Biblically correct. "This Hebrew word means this," they say. They say, "If you read that meaning into this context, it solves the problem, science and the Bible are reconciled." Then I hunt all over the place for that Hebrew meaning for that word and it just cannot be found. It does not happen to mean that at all. And even if the word might approximate the defin-

ition given to it, the context or the syntax would preclude the possibility of the passage teaching what they alleged it taught. Thus the problem still remains unsolved. I think I could multiply illustrations, but I would not know then upon whose toes I might be treading, whether one of yours or even on my own, from something I wrote myself in more illiterate days. We might all be embarrassed! I think it will illustrate the problem that I am getting at, however.

Let us go back to the scientific method which was discussed this afternoon. There was a statement made somewhere along the line, I believe I am stating it correctly, that the difference between the scientific method and what the preacher does is that the scientist can demonstrate his conclusions. I think the illustration was used of pouring water in a hole. If you do this it will go down, then the next fellow can pour water in the same hole. It too will go down. Thus you can demonstrate a conclusion in that area. But wait a minute! Can you demonstrate that conclusion? In the light of the discussion this afternoon, what assurance do we have that some circumstances might not arise to change the picture between the time I make the statement and the time I perform the experiment intended to be corroborative? Rather unlikely, and highly improbable, but still you have to hold it out as a possibility. So what is demonstration then? Can I transfer that problem of demonstrating from the field of science, where it is more probably usable, to the field of hermeneutics where it is less used usually. I think you can. I think we can take it over with a very high degree of usability and success. Let us take a concrete case that has been discussed in some of our institutions, with definite conclusions reached pro and con. Let us take the case of universality or limited character for the flood. Did the water cover all the earth, or all the earth in the context described? In the "all" one of those alls that speak of every last particle on the earth or every last particle in the context in which the story is told?

We have often heard it said that all the world came to Egypt to buy grain from Joseph. North American Indians did not. And presumably, if Carbon 14 is okay, North American Indians were living. They didn't go to Egypt to buy grain. And yet, all the world went to Egypt to buy grain. So here is a very real problem. Some say all parts of the earth were covered with water; some say, No. Can we approach that problem with a scientific attitude and scientific method and reach any likelihood of demonstrable certainty in the conclusion? I believe we can. I believe that if we get a group of people together, some of whom are linguists, some of whom are philosophers, some of whom are systematic theologians, some of whom are scientists of one kind or another, and if we would weigh the evidence pro and con, leaving our own personal, emotional predilections out of the picture and not coming to the conclusion, "Well, if you don't see it the way I do, you're a heretic and we'll not discuss it any more." (Presumably none of us would do that but I have been in meetings where almost the same has been said). If we would get a group of men with various points of view together on a particular problem, and if, after careful investigation and study, all of us would agree *in toto* or all of us would agree about certain aspects of the problem, then we could approach very closely to a scientific demonstration, it seems to me. This would be a scientific demonstration with a very high statistical likelihood of being correct. That, it seems to me, ought to be the next step in this problem of methods between the various societies.

When the Revised Standard Version Committee met they spent many years, but ten concentrated years, in the problem of interpreting the Hebrew and the Aramaic and the Greek. They met in smaller committees and in larger committees. The smaller committee gave the results of its work to a larger committee and the larger committee had the right to make suggestions. Eventually, perhaps over some protest, but with majority agreement, the Revised Standard Version came from the press. Now it seems to me that if men who really are not involved theologically, that is, those men who for the most part are not particularly concerned whether the Bible is true or not, but consider it only as a document that is used and usable, are willing to spend ten years on a project like that, we who believe in the Bible as an infallible revelation from God ought to be ashamed to consider spending any less effort in giving the public a clearer understanding of the Bible and of science.

If there are problems in the minds of our college boys and girls, if they are confused, we should rise to the challenge. If one preacher says this and one preacher says that and the A.S.A. Journal says something else, there is bound to be confusion. If such confusion exists, and it does, then the hour calls for committees of these two societies, and the entire societies, working toward the solution of the problems that created the confusion.

With a good representation of linguists, philosophers, theologians, and scientists on these committees working on particular problems, in meetings and by correspondence, something worthwhile should eventuate. If there is a marked difference of opinion between the members of any given committee they could refer the problem back to the whole, or to both the societies meeting together. The society or societies could lay the matter on the table or appoint a new committee. It might take time to come to a solution either to agree or to agree to disagree. Either solution would be important and significant.

It seems to me that we have all been made aware that interpreting the Bible is not easy. Hermeneutically, it is difficult. There are lots of problems. There are also lots of problems that relate to interpreting science also, but some of the other brethren under-

stand these matters and can throw light on them. It ought to be possible for us to appoint committees which could bring almost to demonstration a conclusion in many of these areas we face. We owe it to ourselves. We owe it to the constitution to which we subscribed. We owe it to the unborn generations yet to follow us, to Christian boys and girls across this nation and around the world to take our talents and our time, and to put these two and two together and really make four out of them.

In the New Testament there is one thought that is many times repeated. I will take them up in chronological order.

Romans 12:4-8: "For as we have many members in one body, and all members have not the same office: So we, being many, are one body in Christ, and every one members one of another. Having then gifts differing according to the grace that is given to us, whether prophecy, let us prophesy according to the proportion of faith; Or ministry, let us wait on our ministering: or he that teacheth, on teaching; Or he that exhorteth, on exhortation: he that giveth, let him do it with simplicity; he that ruleth, with diligence; he that sheweth mercy, with cheerfulness."

I Corinthians 12:7-8, 11,27-28: "But the manifestation of the Spirit is given to every man to profit withal. For to one is given by the Spirit the word of wisdom; to another the word of knowledge by the same Spirit; . . . But all these worketh that one and the selfsame Spirit, dividing to every man severally as he will. . . Now ye are in the body of Christ, and members in particular. And God hath set some in the church, first apostles, secondarily prophets, thirdly teachers, after that miracles, then gifts of healings, helps, governments, diversities of tongues."

Ephesians 4:7, 8 11-13: "But unto every one of us is given grace according to the measure of the gift of Christ." To prove that assertion Paul goes back into the Psalms to take a statement which proves that doctrine. He is not teaching a *decensus ad infernos,* but that all Christ's are gifted and given to His church. The doctrine of the descent to Hades is completely out of context in this place. Paul did not quote the Psalms to prove that Christ went into Hades. He used that verse to prove that unto everyone of us is given grace, according to the measure of the gift of Christ. That is why the Scripture says, "When He ascended up on high, he led captivity captive, and gave gifts unto men." Some of these gifts were "apostles; and some, prophets; and some evangelists; and some, pastors and teachers; For the perfecting of the saints, for the work of the ministry, for the edifying of the body of Christ: Till we all come in the unity of the faith, and of the knowledge of the Son of God, unto a perfect man, unto the measure of the stature of the fulness of Christ."

I would like to think that God has given many different talents. He certainly has. The contribution that we need to make now is to take these talents in the various specialized fields and put them to use on the interpretation of the so-called problem areas in the Bible. If we will do that, it seems to me, we will have a lot of wonderful fellowship, as we have had; we will be producing some good scholarly productions; and we will be doing the job that some of tthe brethren think is primary for the society, the job stated in the constitution.