THE RELATION OF SCIENCE AND RELIGION AS IT PERTAINS TO THE TEACHING OF GENERAL SCIENCE IN HIGH SCHOOL

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With affection and appreciation

these pages are dedicated to

DR. CAROLINE L. PALMER,

my adviser, teacher, and friend--

not that this act can honor her,

but that the use of her name will honor my thesis.

"Faith has no quarrel with science: she foreknows
The truths which science grudgingly bestows.
Faith knows no hindering bonds, she leaps to seize
The truth which science doubts; the harmonies
That men of science learned from age-long thought
Were first revealed to hearts untrained, untaught,
But reverent. Let faith from science learn
Enduring patience; nor let science spurn
The gift of faith, a never-failing love;
Thus, each supporting each, the two shall prove
The final truth of life, that God the Soul
Through perfect law seeks perfect Beauty's goal."

--Thomas Curtis Clark

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INTRODUCTION

A. Statement of the problem

> "Twentieth century science has overridden the barrier between the seen and the unseen. It has come to recognize that its tangibles are in their essential nature inscrutable. It has resolved matter into electrons, protons, neutrons, and positrons as intangible as ever were fairies, pixies, or ghosts." 1

The truth of this quotation will be evident in later chapters of this thesis, for this is the heart of our problem. Invention and discovery have made great strides and the frontiers of our thinking and of our knowledge have been pushed farther and farther outward. Sir James Jeans has expressed it this way,

> "Scientific discovery advances along a continuous front which extends unbroken from electrons a fraction of a millionth of a millionth of an inch in diameter, to nebulae whose diameters are measured in hundreds of thousands of millions of millions of miles." 2

As the horizon recedes before us we have begun to see that science and religion are not conflicting parts of the total truth, but that they are different approaches to the same ultimate truth. "Religion and science are two different pathways of approach to Reality."[3] It is not a question of "either or" but of "both and."

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1. Nathan A. Smyth: Through Science to God, p. 1.
2. Sir James Jeans: The Universe Around Us, p. 10.
3. Frederick Clifton Grant: Frontiers of Christian Thinking, p. 13.

Instead of relinquishing our faith in the light which science gives, science itself becomes a vehicle for revelation, leading us into greater faith. "Thus science and religion no longer stand back to back, one confronting the seen and the other the unseen. Both face a common problem."[1]

To show that there is a definite relationship between science and religion is the problem of this thesis. One wonders what terrible significance the fact of modern science must present to those in our day who refuse to see this relationship. "It is only theists who look out on the newly-discovered universe with comfort and hope. To those who reject Christianity, the new universe is a Gorgon that turns their hearts to stone."[2] We must grant that the purpose of science is completed within itself, but we would also say that science needs the interpretative values of religion to complete its meaning. The experiences of which life is made cannot be contained merely in the search for laws and their application to problems. Experience goes far beyond that; consequently, science cannot be fully related to life until religion gives it the right interpretation and correct values.

We would readily grant that religion, too, needs the truths which science can give. Truth from any science expands our knowledge of God, for "the primordial method of the scientist is to think God's thoughts after Him."[3] Even though the man of religion worships and the man of science inquires, inquiry may lead to worship. If we

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1. Smyth, op. cit., p. 2.
2. R. O. P. Taylor: The Universe Within Us, p. x.
3. Warner W. Watkins and Stanley A. Gillet: A Christian Philosophy of Life, p. 67. Quoting Louis Agassiz

expand our knowledge of the universe by discovery, we do not remove God from it; rather, at the same time, our knowledge of Him increases. It is not too much to expect that inquiry and belief should go hand-in-hand. "The revelations of science and the revelations of religion should mutually guide in their proper interpretation."[1]

One of our tragic mistakes has arisen from our misunderstanding of the essential character of science and religion; consequently, we tried to make each what it never intended to be. The result was conflict and failure to see existing relationships. Let us keep in mind that science is primarily objective, impersonal, and quantitative, and that religion is subjective, personal, and qualitative. Science never intended to have the characteristics which religion has, so in its own purpose it is complete; but the fact that life must have the characteristics which religion has is clear evidence that the interpretations of religion must be added to science to give it full meaning and significance to life. These differences have been summarized in the following way,

> "Science is characteristically given to exploring processes; religion offers meaningful interpretations. Science is concerned with questions and structure; religion deals with the field of values. Science seeks to discover methods of procedure; religion attempts to find the most worthful meanings."[2]

B. Significance of the problem

In this twentieth century we have stood amazed at the marvels of science, but, also, we have stood aghast at the horrible ways in which it has been used. The fact that this is a scientific age explains in great measure the unprecedented progress of the material-

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1. William Owen Carver: The Re-Discovery of the Spirit, p. 50.
2. Charles Edwin Schofield: The Adventurous God, p. 50.

istic philosophy. In this, Religion herself is not guiltless, for she has too long spurned what science had to offer, looking askance at the whole field, and in the repudiation of objectionable theories she threw the baby out of the window with the basket! We are becoming more aware of this fact and at last are beginning to utilize what should have been accepted -- yes, welcomed -- for the truth that it is.

Both science and religion are important factors in our lives, for both are necessary parts of our civilization, our culture, our well-being. Harry Emerson Fosdick says that man is "incurably religious."[1] We grant that; then we must assume that since religion has always been so powerful in human experience, it must contain values that we cannot receive in any other approach to life. That is why it is important for us to see some of the religious implications arising from science. "There is something in religion that ... we can never lose without ourselves becoming irretrievably lost."[2]

The problem for this thesis grew out of the writer's experience as a teacher of science and mathematics in high school. In the teaching of science there was increasing dissatisfaction as the realization grew that something more was needed to give it a fuller meaning and a greater value when applied to life. It seemed such a tragedy to have to stop when we had treated the subject as a scientist would, for there were many religious implications which would have enriched the students' lives and would have given a greater value to the whole course. One of the tragedies of modern education lies in the fact that many young people lose their faith because they are led

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1. Sermon, Riverside Church, September, 1944.
2. Schofield: op. cit., p. 41.

to believe that they must choose between science, which they cannot doubt nor dispute as to facts, and religion, which by its very nature is mysterious. What must be done is to make it clear that they do not have to choose but that they may have both. This thesis will go a step farther than that, showing that science, which goes unquestioned, is fast becoming just as mysterious as religion, for scientists are discovering, as quoted elsewhere,[1] that matter itself in the final analysis is as intangible as spiritual things. The scientists are coming to the conclusion that, after all, the unseen things are the only realities -- and this the man of religion knew all along! Where an objective, factual study of science stops religion can go on, adding invaluable truths to complement those of science. The purpose of this thesis is to show how this may be done.

C. Delimitation of the problem

Our study will be confined to a brief survey of a high-school course in general science and to only three implications arising from it. General science was chosen as the basis of our work because by nature it lends itself well to such a study.

D. Approach to the problem

First, it will be necessary to have a background of general science as it is taught in high school. For this purpose the textbook used in North Carolina was chosen, for the simple reason that it is well written and has been used by the writer of this thesis. Chapter two will point out the limitations in such a course, with the intention of helping the reader to see that religious implications

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1. Supra, p. 1.

are needed to bridge the gap between the students' lives and the offerings of science. Chapter three will deal with the three implications which have been chosen because of their peculiar significance and because they arise so naturally from a study of the text. There are many other important implications which this thesis cannot cover, nor even mention. The ones chosen are representative of the type of work which may be done in this field. Chapter four will be a concluding summary of the evidences shown in this thesis that there is a definite relationship between science and religion, which relationship becomes clearer the farther science progresses.

CHAPTER I

GENERAL SCIENCE BACKGROUND

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A. Introduction

1. Explanation of terms and purpose of general science

As a basis for our study we must have a background of general science. The term "general science" is self-explanatory in some degree, but in order to clarify it completely we should state that it is composed of both biological and physical sciences. To be specific, it contains a small portion of biology, chemistry, physics, astronomy, geology, meteorology, and perhaps other sciences all linked together in natural relationships which the pupil cannot fail to see. It is a general glance at the whole field of science, giving the student the concept of unity, which is so basic and so important, and at the same time suggesting to him the many possibilities for later specialized work in some field. The purpose of such a course is not only to inform the student so that he may in some small measure begin to understand the universe in which he lives, but also to help him feel at home in it. Because of the composite nature of general science it was chosen for our basis, for it lends itself to our purpose better than any single science could.

2. Position of general science in high school curriculum

General science is usually a first-year course in high school. For that reason the text is very clearly written, the treatment of the subject matter being elementary. However, even this works to our advantage, for in showing the relationship between religion and such a basic and elementary text we have at the same time established

our thesis even more firmly in higher scholarship which itself rests upon the same basic principles which we shall use. Even though general science does lay the ground work for other courses, it is not merely a preparatory course, but it is also important within itself.

B. Presentation of the textbook

1. The textbook chosen

This study is based on the textbook used in the North Carolina High Schools, General Science for Today, by Ralph K. Watkins and Ralph C. Bedell. It is well written, both from teacher and student standpoint. The writer of this thesis used it and found it interesting to every class. In a later chapter it will be necessary to point out the limitations in such a course when applied to life, but such a procedure does not in any way disparage the text. It is used without apology or reservation.

2. The authors' viewpoint

In the preface the authors state this objective, among others: "An attempt has been made to present a continuous, uninterrupted story of science as it has affected mankind on the earth."[1] One of the good features of the book is the way this unity is achieved even though there is much material used which would, on the surface, appear unrelated. The authors are perfectly aware of the changing interpretation of all science, and, therefore, have presented conservatively those theories which time may show to be untenable. What is more important, however, is their realization of the reason for changing interpretations. "More and more are we

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1. Watkins and Bedell: General Science for Today, p. v.

beginning to see that there are certain underlying conceptions which help to explain all science."[1] The authors also point out two developments which have greatly helped in the unifying process: discoveries in atomic structure, which have broken down the barriers between different sciences, and a better understanding of the problem of the basic source of energy and how energy changes take place, helping tie together the natural sciences. "In this book the authors have tried to catch this modern notion of the unity of the universe and to use it as a means to better understanding of ourselves and all things that surround us."[2] Even with this expressed purpose we shall see in a later chapter how far short of such a goal science alone must fall.

3. General Analysis of the text

The book itself is in fourteen units, each complete within itself, and yet only an integral part of the whole. "The theme upon which the story is built has three phases."[3] The first phase, including units 1 - 5, begins where the pupil is, dealing with the earth as the home of man, and with its inhabitants. In other words, it deals with environment, primarily -- the earth itself, its surface, the air surrounding it, the waters on it, and living things, including man. The second phase, units 6 - 7, is a progression -- a transition from an understanding of the environment to an attempt to to control it. In this transition there is a study of the nature of the substances of the earth and of the natural forces as they exist

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1. Watkins and Bedell: op. cit., p. vi.
2. Ibid.
3. Ibid., p. v.

in nature. The remaining units, 8 - 14, are covered in the third phase which deals entirely with man's attempts to control the forces of the earth, including heat, light, electricity, and even the forces within his own body. It is clear that there is a unified plan and that the authors have chosen carefully the method of presentation to achieve their purpose.

4. Outline of course of study in general science

UNIT I. THE ATMOSPHERE AS A PART OF THE EARTH
- Chapter 1. Nature of the Atmosphere and Atmospheric Pressure
- Chapter 2. Man Control of Atmospheric Pressure
- Chapter 3. Weather and Climate

UNIT II. WATER ON THE EARTH
- Chapter 4. Water Supply
- Chapter 5. How Water Is Used to Do Work

UNIT III. THE EARTH UNDER OUR FEET
- Chapter 6. The Nature of the Earth's Crust
- Chapter 7. The Causes of Changes in the Earth's Crust
- Chapter 8. Man's Uses of Rocks and Minerals

* UNIT IV. THE EARTH AND ITS RELATION TO THE UNIVERSE
- Chapter 9. The Earth's Companions in the Solar System
- Chapter 10. Movements of the Earth
- Chapter 11. Man's Knowledge of the Nature of the Universe

UNIT V. LIFE ON THE EARTH
- Chapter 12. The Living Cover of the Earth
- Chapter 13. Our Fellow Inhabitants of the Earth
- Chapter 14. Ourselves As Inhabitants of the Earth

* UNIT VI. THE SUBSTANCES OF THE EARTH
- Chapter 15. The Substances of the Earth

UNIT VII. THE FORCES OF NATURE AS THEY ARE FOUND ON THE EARTH
- Chapter 16. Some Natural Forces on the Earth
- Chapter 17. Simple Machines Used to Control Natural Forces
- Chapter 18. Complex Machines Used to Control Natural Forces

UNIT VIII. LIGHT AND HEAT
- Chapter 19. Changing Energy in Fuels to Heat
- Chapter 20. Heat Control in the Home
- Chapter 21. Control of Heat Energy in Machines
- Chapter 22. Man's Control of Light Energy

UNIT IX. ALADDIN'S GENIE OF TODAY -- ELECTRICITY
Chapter 23. The Relation of Electrical Energy to Chemical Energy
Chapter 24. The Relation of Electrical Energy to Mechanical Energy
Chapter 25. The Control of Electrical Energy for the Home

UNIT X. SOUND AS AN ILLUSTRATION OF ENERGY CONTROL
Chapter 26. Sound As An Illustration of Energy Control

* UNIT XI. HOW WE MANAGE TO KEEP ALIVE
Chapter 27. The Nature of Living Matter
Chapter 28. Running Our Own Machinery
Chapter 29. Modern Evil Spirits and Modern Magic in the Control of Disease

UNIT XII. MAN AS THE FRIEND OR ENEMY OF OTHER LIVING CREATURES
Chapter 30. The Conservation of Plant and Animal Resources
Chapter 31. The Improvement of Life on the Earth

UNIT XIII. IMPORTANT IDEAS THAT HAVE CONTRIBUTED TO MAN'S CONTROL OF HIS WORLD
Chapter 32. Important Ideas That Have Contributed to Man's Control of His World.

UNIT XIV. SOLVING THE PROBLEMS OF NATURAL SCIENCE
Chapter 33. How Scientific Information Is Secured
Chapter 34. Sources of Reliable Scientific Information

C. Selection of particular units for this study

The three units marked with an asterisk will be presented in detail in chapter two, showing just what is given in the units and at the same time showing the necessity for religious implications to make the facts of science more meaningful.

CHAPTER II

LIMITATIONS OF SCIENCE ALONE

TO INTERPRET LIFE

CHAPTER II

LIMITATIONS OF SCIENCE ALONE TO INTERPRET LIFE

A. Introduction

In presenting the three units which have been chosen for this particular study, the approach will not be one of disparagement of the text, but will be an attempt to show that in the interpretation of the whole of life, science is not adequate. We grant that science does that which it claims for itself, but its claims do not include the whole of life. For this reason, our attempt will be to show wherein it fails to satisfy the whole nature of man. Knowledge which satisfies only part of our nature must of necessity be only a part of the truth and be in need of other truth to complement its meaning. We believe, with Dr. Fosdick, that man is "incurably religious"[1] and we take the position that this side of man's nature must find an answer before life is complete for him. Science, by its very nature, is limited in providing such an answer, but religion can build on the broad and stable foundation which science lays; and at the point where science is bounded by its own limitations, religion can join hands and provide the final and satisfying answer.

The facts which are presented in these units are inviolable, but as we proceed it will become more apparent that they are not the sufficient and ultimate answer which human nature desires. It will be clear, also, that many times the authors take us to the very point where science and religion meet. To go beyond that point is not the function of science; rather, it is the duty of religion to recognize

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1. Ante, p.4.

the contributions of science and to add the interpretative values. Our purpose is to make clear these points of contact between science and religion and to show that they are the outer boundary lines of science.

These three units are made up very interestingly. At the beginning of each there are unit problems which the student attempts to answer before the study of the unit and which he should certainly be able to answer after the unit has been completed. Following the unit problems there is a preview -- "What You May Expect to Find in This Unit." Then the chapters are presented in detail. We shall follow the same plan of presenting the material, much of which will be summarized in an effort to give as complete a view as possible of what each unit contains. Material that is of little consequence to us in this study will be omitted entirely wherever justice can be done to the textbook without it. At various places the limitations of the textbook material to interpret life will be pointed out, and at the end of this chapter there will be a concluding summary of these limitations in the three units of our study.

B. Unit IV-- The Earth and Its Relation to the Universe

1. Unit problems and preview

The unit problems[1] are stimulating questions, but, though their answers are definite, they are not always satisfying.

a. What do scientists know about the stars?
b. What are planets?
c. Are other planets like our earth?
d. How big are planets and how far away are they?
e. What do modern astronomers know about the sun?
f. Why does the moon appear to change shape?
g. What causes an eclipse?

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1. Watkins and Bedell: op. cit., p. 115

h. What is the most modern idea of the beginning of the solar system?
i. What is meant by the law of gravitation?
j. Why do we have the tides?
k. How do the movements of the earth affect our daily lives?

In the preview there are these significant statements:

"All things are drifting in space, the extent of which no one has seen, whose depth no instrument has ever fathomed, whose substance is so thin that it can be compared with none of the materials we know on earth. Compared with space, even the partial vacuum in an electric-light bulb is thick and heavy. The universe is so vast that it is almost impossible for the human mind to imagine its size. Yet its immensity is not its most remarkable characteristic. More awe-inspiring than this is the fact that everything in space moves with perfect order... We know that the universe moves with an orderly precision greater than man is able to duplicate, even in the best laboratories. We know the exact time when the sun is over the equator, and exactly when it is farthest north or farthest south. We know exactly when the next eclipse of the sun or eclipse of the moon will be. We even know when every eclipse for hundreds of years to come will occur." [1]

This preview makes clear some of the limitations of science in the full interpretation of life. More than once the authors move up to the place where there is only a step between science and religion, but it is not their purpose to take that step in writing the book, though it is our need as we study it. The stage is all set, but the curtain is rung down before the finale. The admission of God as Creator and Sustainer is all but made, but it is not made, for that is not the function of science. As far as science itself is concerned, the thing that is not said here is the most obvious thing of all--that there is a law of continuity without which the universe would be, in the words of Henry Drummond, "incoherent and irrelevant," "deranged," and "mad."[2] Without this law of continuity we would have a chance world and there would be "permanent intellectual confusion."[3] In

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1. Watkins and Bedell: op. cit., pp. 115, 116, 117.
2. Henry Drummond: Natural Law in the Spiritual World, p. 38.
3. Ibid., p. 40.

stating the orderliness and precision of the universe, the authors acknowledge the facts and results of this principle, which is not admitted at all. The authors make out a strong case for rationality in the universe, but give no explanation for it. Dr. William Osborne Greenwood says,

> "The conception of God would appear to be not only legitimate, but to be demanded if we are to regard the scheme of things as possessing any rationality." 1

2. Chapter 9--The Earth's Companions in the Solar System

a. Introduction

This chapter takes up in a general way the relative positions, sizes, and characteristics of the members of the solar system, beginning with the earth in relation to the others, especially to the sun. At the end of the chapter limitations will be pointed out.

b. The sun

> "Some realization of the immensity of the universe can be had when we know that only about two thousand of the twenty or thirty billion existing stars can be seen at any one time; that although the stars appear small to us, they do so only because they are very far away. In reality, each star is a sun many thousand times as large as the earth. Since we are dwellers on the earth, we are most interested in our closest star--the sun--because it gives us light and heat, which make life possible." 2

The volume of the sun compared to the earth is one million times greater. Of the entire mass of the solar system, the sun contains nearly 99.9 per cent, the remaining 0.9 per cent making up the planets, their moons, the planetoids, meteors, and other small bodies which are controlled by the sun.

The composition of the sun has been at least partially de-

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1. William Osborne Greenwood: Biology and Christian Belief, p. 36.
2. Watkins and Bedell: op. cit., p. 118.

termined by the use of the spectroscope, which is only a prism, in breaking up the white light from the sun into a series of colors, each indicating a definite element. More than forty of the known elements of the earth are present in the sun, also.

The surface of the sun is "a great mass of glaring, white-hot gas, continually stirred up by storms."[1] The temperature of the surface has been estimated at from 9,000 to 12,000 degrees Fahrenheit. At this temperature all solids which we know on earth would immediately turn into gas. There is a blanket of haze about the sun from 500 to 1,000 miles in depth. Above this haze is another region which is seen only during an eclipse.

> "This (region) is a sea of red, leaping flames from 5,000 to 10,000 miles deep. Glowing gases, especially hydrogen and calcium, are always being shot out from the surface of the sun with tremendous violence. These incandescent materials are thrown nearly 300,000 miles into space before they fall back into the sun, and at a speed of more than 300 miles a second. This region of the sun is perhaps the most awe-inspiring sight available to the eyes of man." 2

c. The moon

In contrast to the great size and energy of the sun, the moon is cold and dead and only about one-fourth the size of the earth. It is really insignificant in the solar system, but because it is the closest body to us, it is important out of proportion to its size. The surface has many great holes, and most likely there is little atmosphere or surface water. There are mountains five miles high, and because they have not eroded they are steeper and sharper than the mountains on the earth. Because there is no air on the moon, the nights would be very cold, daybreak would come suddenly, stars

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1. Watkins and Bedell: op. cit., p. 121.
2. Ibid.

would be visible both day and night against a black sky, there would be no sound, no odors, and no vegetation.

d. The planets

There is a short description of each of the planets, with the exception of the earth. These nine planets, beginning with the one nearest the sun and moving outward, are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto.[1] From all the facts given in the text there is only one conclusion to which the reader can come--that conditions on no other planet except the earth are conducive to life. Even Mars is probably too cold and has too little air for any life except the very lowest forms.

Neptune was discovered because some astronomers found that another planet, Uranus, was not following the orbit they had predicted for it after studying its movements. Their explanation for this strange behavior was that it was being attracted by another planet. After intricate mathematical calculations the suspected planet was located in 1846. The second planet that was found in this way was Pluto, discovered in 1930 by the staff of the Lowell Observatory, Flagstaff, Arizona.

e. Comets

Comets, also, operate according to schedule. From where they come and to where they go we do not know, but they move in "definite orbits which can be predicted after some observation."[2] Some of them never return, others return regularly. One of the most famous is Halley's comet, which appears every 75 years.

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1. Of these nine only the last three have been discovered in the last 3000 years. New York Herald Tribune, March 13, 1930.
2. Watkins and Bedell: op. cit., p. 131.

f. Limitations in this chapter

There are two major limitations in this chapter. First, the second law of thermodynamics, also, should be considered. This law states that energy always runs down hill and cannot return, but is finally in an unusable state, though in as great a quantity as before. Sir James Jeans says,

> "Turnstiles are set up between different qualities of energy; the passage is easy in one direction, impossible in the other." 1

When we accept this law we are faced with the possibility that sometime there will be no more available energy, the sun will be cold and dead, and life will end. The universe will have run down. At the other end, our authors do not mention the origin of all this energy. Since it must have an end it must, also, have had a beginning. Henry Drummond states it this way:

> "There is...a point in time when the energy of the universe must come to an end; and that which has its end in time cannot be infinite, it must also have had a beginning in time. Hence, the unseen existed before the seen." 2

Neither the silence of the scientist in regard to the origin of the energy in the universe nor his answer as to its final end is satisfying to us.

Second, as in the preview, science is limited because it cannot take into account all the implications of the law of continuity in regard to the discovery of Neptune and Pluto by means of mathematical calculations. To us who seek the ultimate answer in terms of religion, the significant thing is the Power behind this law of continuity. To the astronomer, the law itself and its effects are all that can be included within the scope of science. However,

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1. Jeans: op. cit., p. 308.
2. Drummond: op. cit., p. 54.

scientists give great recognition to this basic principle which made possible these two important discoveries.

> "Neptune was discovered in 1846 as the result of intricate mathematical calculations, which many at the time regarded as the greatest triumph of the human mind, at any rate since the time of Newton." 1

When Pluto was discovered in 1930, scientists everywhere hailed this great accomplishment. Captain C. S. Freeman, the superintendent of the Naval Observatory in Washington, said:

> "Neptune was discovered where mathematical calculations had located it. In the same way this trans-Neptune body was discovered by the Lowell Observatory to be just where the mathematics of the late Percival Lowell...has put it. The discovery announced today has been expected for years. The reasons for predictions that it would be discovered was that Neptune travelled in a way which could not be accounted for by any known bodies. It is perfectly possible to discover such bodies by mathematics. The photography at the Flagstaff Observatory picked out the new body on the exact location shown by Dr. Lowell...." 2

Another noted astronomer, Dr. Mars Baurgardt of California, said:

> "The main reason the find is valuable is because it bears out our astronomical calculations by which we have known for a long time that another, a ninth, planet existed." 3

It is significant that the universe operates in such a way that these discoveries can be made as the result of exact calculations rather than merely by searching blindly. For the orderliness, regularity, precision, and continuity of the universe, we seek a more complete answer than science, limited by its very nature, can give us.

3. Chapter 10--Movements of the Earth

   a. Origin of the solar system

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1. Jeans, op. cit., p. 18
2. New York Herald Tribune, March 13, 1930
3. Ibid.

The planetesimal hypothesis, as an explanation of the origin of the solar system, is based on the fact that astronomers, using the spectroscope, have proved that in the composition of all the members of the solar system many of the same materials are found; consequently, they believe that all the planets, their moons, and other small bodies all came originally from the sun. Astronomers believe that sometime another star came near enough to the sun to exert a gravitative pull.

> "Great arms of gaseous material are thought to have been forced from either side of the sun and bent into spirals by the attractive force of the visiting star as it passed by. The sun's gravity was not strong enough to pull back its substance after the star had moved on, so that the matter in the spiral arms remained detached. In the cold of space this gaseous material quickly froze to solid bodies which took the form of knots, some large and some small, with many finer particles between. All such bodies, known as planetesimals, or little planets, are thought to have revolved in orbits around the sun. In time the large knots in the spiral arms collided with the smaller particles and absorbed them. Each large knot was the forerunner of a planet and grew by sweeping up the smaller planetesimals. The moons of the planets, growing in the same way, never became as large as the planets because they were smaller at the start and could not attract so much material." 1

b. The Law of Gravitation

> "Nobody knows the exact nature of the mighty forces which keep the earth and all other heavenly bodies in motion." 2

However, we do know that these "mighty forces" operate according to a law which was mathematically proved by Newton. That law states that the attraction of bodies for each other is directly proportional to their masses and inversely proportional to the square of the distance between them. The gravity of the moon, plus the rotation of the earth, causes tides every twelve hours and twenty-five minutes.

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1. Watkins and Bedell: op. cit., pp. 134-35. cf. Tidal Theory, Jeans
2. Watkins and Bedell: op. cit., p. 135

c. Telling time

If we set up a telescope on a meridian, the exact time when the sun is in the middle of the telescope is noon. The time between two such appearances of the sun in the telescope is a solar day.

> "The earth rotates so regularly on its axis that there is less than one second variation in 100,000 years. Due to this regularity, we have a clock far more accurate than any time piece invented by man and one by which man can check the errors in his own instruments." 1

d. Limitations in this chapter

That the explanation given for the origin of the solar system is only a hypothesis is evident. At best it can never become more than a theory, for it is not possible to test and prove it as a law. It is not our purpose to agree nor to disagree with such an hypothesis. Other hypotheses, also, have been offered, particularly the nebular hypothesis which has been generally discarded. However, our purpose is to point out how this explanation fails to satisfy those who seek the complete meaning of the facts presented. Even if we grant the possibility of such an origin for the solar system, we still do not have the final answer, for we have no explanation as to the origin of the sun in the first place. Neither do we know why a visiting star would come close enough to the sun to cause such a great change. We are not willing to admit that such an event as the birth of our solar system would be merely by chance. Even granting all this, we have still to account for the visiting star and the source of its energy in travelling about the universe.

In the second place, the authors make a significant admission in regard to gravity, but it is not enough merely to admit

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1. Watkins and Bedell, op. cit., p. 137.

that we do not know the nature of the forces that operate the universe. Science says that these forces are and that they operate according to law, but there is no explanation of the origin of these forces nor of their continual energy for operating so vast a universe.

The third limitation is in relation to the truth so clearly implied in the regularity of the earth's rotation. This precision is mute evidence that this cannot be a chance universe, that there must of necessity be some controlling Power. On this point science must be silent.

4. Chapter 11--Man's Knowledge of the Nature of the Universe

a. Other worlds

In comparison with other distances in the universe our solar system is relatively small. Since Pluto is the planet farthest from the sun, its orbit will naturally be the greatest and will mark the outside boundary of our solar system. The distance from the outer edge of Pluto's orbit to the opposite edge of it is about 8,000,000,000 miles, or far enough that it would take a bullet about 750 years to travel across it. Such distances are difficult to imagine, but there are more staggering facts to come.

> "...compared with the distance of the earth from the nearest star, Proxima Centauri, it (the solar system) is a relatively small and compact group of heavenly bodies. Compared with the Milky Way, its size becomes an almost insignificant speck." 1

Because astronomical distances are so great they are not measured simply in miles but in light years. Since light travels at the rate of 186,285 miles per second, a light year would be 186,285 x 60 x 60 x 24 x 365. With this definition in mind, the following

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1. Watkins and Bedell: op. cit., p. 141.

statement gives us some idea of the vastness of the universe:

> "The Cluster of Hercules is so distant that the light given out by it at the time of the birth of Christ will not reach us until after the year 34,000." 1

In comparison to that, light crosses the solar system from the sun to Pluto in about six hours and to us in eight minutes.

It is believed that the stars in the whole universe are grouped in somewhat the shape of a watch whose greatest diameter is from ten to fifteen times the thickness. The circumference of this disc is so great that it would take light 150,000 years to travel around it. The stars seem more thickly grouped in the Milky Way, and our position in relation to it would indicate that we are near the outer edge, looking through the long diameter of our universe, or galaxy. But even that is not all.

> "There are other galaxies far beyond our own. These galaxies may be imagined as separate worlds, or, as one astronomer has said, 'island universes.' Just how many there are we cannot be sure because some are so distant that they appear as only small blurs in the most powerful telescopes." 2

b. Nebulae

A nebula is a cloud of stars that cannot be separated into individual stars. Apparently some nebulae are within our galaxy; others without it. They vary in size and appearance, though it would be difficult to imagine the size of even the smaller ones. These nebulae indicate the vastness of the unexplored universes.

> "Much fascinating reading awaits those who care to dip into the literature of astronomy. There one can read the stories of the distant star worlds; of hot, bright stars like our sun; of dark, dead stars burned to cinders; of single and multiple stars in open and closed clusters; of stars in vast, irregular clouds; and of the nebulous fire mist which constitutes one of the most

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1. Watkins and Bedell: op. cit., p. 141
2. Ibid., p. 143.

baffling mysteries of the heavens." [1]

c. Limitations in this chapter

The two main points in this chapter are the vastness of the universe and our relative position in it. These things are important, but they are not the final answer which we seek. The greater the scientist finds the universe to be, the more necessary it is to postulate a Cause and a controlling Power. This is not within the scope of science to do.

5. Summary of limitations in this unit

a. Even though the results of the law of continuity are given in some detail, the law itself with all its implications is apparently not recognized for the basic principle that it is. Abundant evidence is presented that things in our universe are not left to chance, but that is not admitted. Science, observing the order and precision of the universe and building upon them, cannot explain them.

b. In considering the second law of thermodynamics and its implications, we are not satisfied with the answer which science gives for the ending of our universe, nor with the silence in regard to its beginning.

c. The size of the universe, which the authors are careful to make as understandable as possible, necessitates the postulation of a Creator and a Sustainer. Here, again, science must be silent.

In this unit it is evident that physical science has "left off trying to explain phenomena and resigned itself merely to describing them in the simplest way possible."[2] Science which must so limit

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1. Watkins and Bedell; op. cit., p. 145.
2. Jeans: op. cit., p. 317.

itself cannot possibly have the final and complete answer which we seek. In such a procedure the basic facts are overlooked and the Primary Source is ignored. Not only is that unsatisfactory to us from a religious standpoint; it is not even good scientific method.

C. Unit VI--The Substances of the Earth

1. Introduction

In this unit our purpose will be to see the structure of the atom, the miniature counterpart of our huge solar system, and to see wherein science fails to make complete for us the meaning and value of such a study. The unit problems and preview are not significant enough to us to be given here.

2. Chapter 15--The Substances of the Earth

If we take such a common thing as water and ask of what it is made, the answer will be, "Of hydrogen and oxygen." Then we should like to know of what are hydrogen and oxygen made. Our answer is that they are made of atoms, each substance being made of its own particular kind of atoms so that each element is composed of atoms that are alike to each other but different from the atoms of all other elements.

Atoms are so small that not one has ever been seen. Much of what is believed about them is based only on what they are observed to do. As the result of research, the atomic theory has developed. This theory is that atoms are composed of electrons and protons, each carrying a charge of electricity, the proton being positively charged and the electron negatively charged.

> "Each atom is a sort of miniature solar system which consists of protons, or a nucleus of protons and electrons together, and planetary bodies that move about the center." 1

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1. Watkins and Bedell: op. cit., pp. 212-13.

Since the electrons are very light, the most of the weight of an atom is in the center. Even though atoms are so small, electrons and protons are much smaller. In spite of the smallness of atoms there is much space in them which the electrons and protons do not fill.

> "In size, an electron bears about the same relation to an atom that a pea does to a cathedral. There is so much space in an atom of gold that electrons can be shot through thin gold foil without touching the foil.... No one has seen electrons any more than he has seen the atoms in which they exist, because the assumption of their presence is the only theory that enables us to understand the properties and behavior of the elements." 1

Ninety-two elements, composed of atoms, have been found. Others may exist and are suspected, but have not been verified. These ninety-two known elements, plus the few other possible ones, are the substances from which all things are made. As they are in combination with each other, compounds are formed in an endless variety of ways.[2]

When atoms are grouped as a unit they form a molecule. Thus we have a series of terms for particles of matter, beginning with electrons and protons as negative and positive, composing the atom, and atoms composing molecules, and molecules making elements.

3. Summary of limitations in this unit

In this unit, as in that on the universe, the scientist can define and explain only so far. Having broken down matter into electrons and protons he is faced with the problem of defining them. His answer is that they are charges of electricity. But what is electricity? Nobody knows. Even Lord Kelvin, often called "the Napoleon of

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1. Watkins and Bedell: op. cit., p. 213
2. There are more than 300,000 organic compounds of carbon. Francis Earl Ray: Organic Chemistry, p. 3.

Science," said of electricity, "it is a mystery and I have not the remotest inkling of what it is."[1] In accepting the electronic theory of matter we still have no final solution to the problem of the nature of matter; instead, there is a greater mystery than before. "Whatever these constituents of the atom are, they are not the ultimate and fundamental reality."[2] The electronic theory breaks down the wall between the material and the spiritual by saying that matter is not a solid but a force. Here science must stop.

The second limitation is that science, after failing to reach the ultimate answer in regard to the nature of matter, has no satisfying analysis and explanation of its complexity. Sir James Jeans says that there are "600,000 million molecules to the cubic inch."[3] Remembering that atoms are still smaller than molecules, it is impossible for us to imagine, in the words of our authors, that "each atom is a sort of miniature solar system,"[4] with electrons revolving around the nucleus which is composed of protons or of protons and neutrons together. Along with the minuteness and complexity of the atom, another thing is significant--the behavior of the atom is so consistent and so predictable that the electronic theory developed because of it.[5] As in the greater objects of the universe, the law of continuity is a basic principle in this ultra-microscopic world, also. On this principle much of modern physics and chemistry rest.

D. Unit XI--How We Manage to Keep Alive

1. Introduction

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1. Worcester and McComb: Body, Mind, and Spirit, p. 59.
2. Taylor: op. cit., p. 59.
3. Jeans: op. cit., p. 91.
4. Ante, p. 25.
5. This is not true of each individual atom but of a statistical average.

In this unit we shall take up only the material pertinent to our need. This will include the first chapter in some detail, small parts of the second, but none at all of the third. We shall omit the unit problems, also.

2. Preview

> "Chemists tell us that the human body is made of very ordinary substances, such as carbon, nitrogen, hydrogen, and oxygen. Nothing about these substances would seem to live nor to give any key to the nature of living substances in themselves.... These compounds do not live but are found in living matter. No scientist can explain why things live, but scientists have determined what things are necessary for continued living." 1

The limitation here is frankly admitted--that the scientist does not know why things live. Not only is the fact of life a mystery, but the way the body can take the substances mentioned, some of which are inorganic, and transform them into living tissue is as great a mystery. "As for the 'how,' neither biologist nor physiologist nor anyone else has any knowledge or even any idea."[2]

3. Chapter 27--The Nature of Living Matter

a. Living Matter

> "All living things are made of a substance called protoplasm. Protoplasm is a jelly like substance of a grayish color, containing water and some solid particles which give it a granular appearance. The cell is the smallest unit of protoplasm.[3] All living things are constructed of cells of protoplasm. Each cell consists of the granular substance and a thicker spot of protoplasmic substance near the center, called the nucleus." 4

All living things perform certain functions, whether one-celled animals like the amoeba and the paramecium, or highly devel-

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1. Watkins and Bedell: op. cit., pp. 425-426.
2. Greenwood: op. cit., p. 84.
3. The gene has replaced the cell as the unit of protoplasm. William M. Agar: The Dilemma of Science, p. 99.
4. Watkins and Bedell: op. cit., p. 427.

oped animals. These functions are assimilation, growth, excretion, sensitiveness to stimuli, movement, and reproduction. These are the functions by which we distinguish between the living and the dead. Machines made by man may do some of these things but not all of them. A radio is sensitive to electromagnetic waves in space, and an automobile consumes fuel and gives off waste, but neither a radio nor an automobile can grow or repair itself or reproduce other machines like itself.

Growth and repair take place by cell division. In biology, as in chemistry, there is a series of units, each leading to something larger and more complex than itself. Cells grouped together form a tissue, tissues form an organ, and a group of organs compose an organism. The higher we ascend the scale in both the plant and the animal kingdom the more complex do these succeeding units become.

b. Conditions necessary for life and growth

The things that are necessary for life and growth are the right temperature, sunlight, oxygen, and food, which would include water, minerals, and vitamins. Of these necessary things sunlight is very important. Upon it depends the process which we call photosynthesis, the process by which green plants manufacture food from water and minerals from the soil and carbon dioxide from the air.

> "Sunlight is therefore necessary for the life of all green plants and indirectly for all other plants and for animals dependent upon them for food." 1

c. Limitations in this chapter

The first limitation is that biology, like astronomy and physics, reached a point beyond which it cannot go. That point is

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1. Watkins and Bedell: op. cit., pp. 433-434.

protoplasm. Science can describe it; it cannot explain it.

> "Although many discoveries have been made about the nature of protoplasm within the last few years, they seem, by enlarging the scope and changing the method of attack, to have placed the final understanding of this problem still further from our grasp." 1

We know that the protoplasm of the human body is mostly hydrogen, oxygen, nitrogen, all three of which are gases, sulphur, and sometimes phosphorus, plus a few salts. There is nothing noteworthy about any of these substances; they all are found in the head of a lucifer match. The mystery is how protoplasm, which, as far as we are concerned, is mostly gas and water, has life.

The second limitation is in regard to the law of biogenesis. This great principle that life can come only from life, one of the cornerstones of biology, cannot be ignored nor repudiated; yet, when the biologist accepts it, he faces the problem of the origin of life. Henry Drummond says,

> "It (science) knows nothing about its (life's) ultimate nature. It cannot even define it. There is a helplessness in scientific books here, and a continual confession of it which to thoughtful minds is almost touching." 2

The third limitation is that science cannot explain the mystery in the process of photosynthesis. This process has been called the "central fact in life on this planet."[3] Whatever occupies such a place of prime importance would naturally be more significant to us if a full interpretation were possible. That science cannot give.

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1. Greenwood, op. cit., p. 50--quoting Whitfield and Wood: Introduction to Comparative Zoology
2. Drummond, op. cit., p. 91.
3. R. C. Macfie: Science Re-Discovers God, p. 88

4. Chapter 28--Running Our Own Machinery

a. Introduction

We shall deal only with the last section of this chapter--the brain and nervous system. We are not particularly interested in the structure of the nervous system, but we are concerned about what is said in regard to keeping it in good health.

b. The brain and nervous system

Whatever encourages general health of the body helps in keeping the brain and nervous system in good condition. Proper diet, good elimination, rest, and exercise all help.

> "The nervous system and various other parts of the human body were originally built for a relatively slow-moving, quiet life. Modern life, especially in cities, with all its machinery, noise, and many interests, tends to put severe strains upon the human nervous system. Living at a slower pace and being in less of a continued hurry is advisable for many people to save wear and tear on the nervous system." 1

Regular routines, especially for rest and sleep, will aid greatly in the solution of this problem.

> "Probably the chief single cause of serious defects in the central nervous system is the condition commonly called worry. Continued worry is likely to produce the condition of the nervous system which we know as a nervous breakdown. A moderate pace of living, regular habits, sufficient sleep, and proper rest are protections against such a condition. In order to avoid nerve complications, it is necessary to have something to do and think about other than the cause of the worry. Play is a means of securing change of activity and change of thought. Each individual needs something at which to play that differs from his ordinary occupation. Various games and hobbies may serve this purpose." 2

c. Limitations in this chapter

The limitation here is the inability of science to give a solution to the problem of mental health. All the things which the

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1. Watkins and Bedell: op. cit., p. 469
2. Ibid., p. 470.

authors suggest are certainly means to the desired end, but they are not complete. In stating the relationship between worry and a nervous breakdown, the authors are faced with the problem of what is to be done with worry. Their solution is inadequate, for correct habits, play, and hobbies are within themselves insufficient to integrate a personality. That science cannot deal with the total personality must be recognized, and the point at which science is limited, religion must provide a solution.

5. Limitations in this unit

a. In dealing with protoplasm, science reaches the point beyond which it cannot go, for this physical basis of life is a mystery.

b. Life itself is a mystery and the word "still wanders through science without a definition."[1]

c. In the very important problem of mental health, science cannot give a total solution because it cannot deal with the total personality.

E. Concluding Summary to Chapter II

In this chapter we have presented parts of three units from the textbook and have pointed out various places where science is inadequate to interpret the whole of life. Science can go only to a certain point; then, regardless of whether it is astronomy, physics, chemistry, biology, or any other science, it must confess its limitations. From the two extremes of the outer reaches of this great universe to the minuteness of the electron and from the unfathomable mystery of life itself, our authors have massed overwhelming evidence

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1. Drummond, op. cit., p. 87.

of a Creator and a Sustainer, whose ways are past finding out and whose work is perfect. In spite of all the evidence, however, the authors make no such admission, for science deals only with the objective, quantitative, and impersonal.

The specific limitations which have been presented in this chapter may be summarized as follows:

1. We have not found a satisfying explanation for the order, precision, and continuity of the universe, since it is not the function of science to give such an explanation.

2. The implications of the second law of thermodynamics call for an explanation of the origin of the universe, since it must have had a beginning in time. This explanation, likewise, is outside the scope of science.

3. Science has no ultimate answer as to the nature of matter, for the more closely this problem is pursued, the nearer the approach is made to the spiritual world, with which science, by its very nature, cannot deal.

4. In defining and explaining life, science admits its limitations. The more the scientist knows the more elusive does life become.

5. In the problem of mental health science does not have the full solution, for the greatest factor in integrating personality is not objective, quantitative, and impersonal, but subjective, qualitative, and personal. That factor is religion.

CHAPTER III

RELIGIOUS IMPLICATIONS ARISING FROM A STUDY OF THE UNITS PRESENTED IN CHAPTER II

CHAPTER III

RELIGIOUS IMPLICATIONS ARISING FROM A STUDY OF THE UNITS PRESENTED IN CHAPTER II

A. Introduction

In the material presented in the preceding chapter, two things stand out clearly: first, that a study of science inevitably takes us toward that which is supernatural and spiritual; and, second, that beyond the point to which science can go there must be a further explanation to complete the meaning of the whole of life. At the point at which science stops religion meets it, and, through interpretation and evaluation, complements its meaning for us, adding the necessary explanations and solutions which lie outside the scope of science but which are vital in our lives.

That science has valuable contributions to make to religion we have already granted and have shown that, in many ways, science lays a foundation upon which religion can build. "The visible is the ladder up to the invisible; the temporal is the scaffolding of the eternal."[1] It is now our purpose to show how religion may take advantage of that which science offers, and proceed, from their points of contact, to final and satisfying conclusions.

From the material used in chapter two, many religious implications arise, but there are three main ones with which we shall deal, taking them in the same order in which the material has been presented. To establish even more firmly the basis for these implications, additional scientific material will be presented in this

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1. Drummond, op. cit., p. 57

chapter, also.

B. Existence and nature of God

1. Evidences from astronomy

a. Immensity of the universe

From the material presented from our textbook, we already have some idea of the tremendous size of the universe, but because it is difficult for us to conceive such great distances it will be well for us to state some of these facts in various ways. Sir James Jeans give us the following scale for a model of the universe:

> "The earth, travelling 1200 times faster than an express train, makes a journey of 600 million miles around the sun every year. Let us represent this journey by a pinhead one-sixteenth of an inch in diameter. This fixes the scale of our model; the sun has shrunk to a minute speck of dust 1/3400 inch in diameter, while the earth is a still more minute speck which is too small to be seen even in the most powerful microscopes. On this scale the nearest star in the sky, Proxima Centauri, must be placed about 225 yards away, and to contain even the hundred stars nearest to our sun in space the model must be a mile high, a mile long, and a mile wide." 1

But that is only a beginning. In this model we go outward 7,000 miles to the farthest globular cluster, and we are still within our own galactic system. In going beyond our galaxy we would have to go outward for another 30,000 miles to the next family of stars or extra-galactic systems; and we go on adding a family of stars for every 30,000 miles or so until we have included about two million such families. "The model now stretches for about four million miles in every direction."[2]

Even that is not all. Jeans goes on to say that this model which we have imagined represents merely the distance which a telescope permits us to see into space, and that this is only a

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1. Jeans, op. cit., p. 82.
2. Ibid., p. 83.

"fraction of the universe." [1]

Perhaps we can express this vastness in another way. The number of stars has been variously estimated as being 30,000 million,[2] 100,000 million,[3] and 300,000 million.[4] Actually 1,500 million have been shown by the 100-inch telescope at Mt. Wilson Observatory.[5] Yet Jeans says:

> "Empty Waterloo Station of everything except six specks of dust and it is far more crowded with dust than space is with stars.... The universe consists in the main not of stars but of desolate emptiness-inconceivably vast stretches of desert space in which the presence of a star is a rare and exceptional event." [6]

Let us try to express all this in still a third way. The model to which we have referred represents the greatest distance human eyes have seen into space. In terms of light years that means a distance of 140 million light years.

Jeans simplifies it all by saying that astronomers have perhaps been discovering only America and that the rest of the world is waiting to be explored. What has already been done is merely a fraction of what there is left to do, and so far astronomers have been only staking out claims and leaving landmarks.

Our universe, then, is greater than we know and far beyond all human comprehension. Yet man is striving to comprehend it, for in that understanding he would find something to add to his completion.

"Before he can understand himself, man must first understand

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1. Jeans, op. cit., p. 83.
2. Ibid., p. 63--Seares' estimate
3. Ibid., Shapley's estimate
4. Ibid., p. 64--Eddington's estimate
5. Ibid.
6. Ibid., p. 84.

> the universe from which all his sense perceptions are drawn. He wishes to explore the universe, both in space and time, because he himself forms part of it, and it forms part of him." 1

This, then, is the reason why he wishes to understand it scientifically, and also the reason why he needs to find the final answer which religion alone can supply.

b. Order and precision in the universe

> "The universe does not consist in an enormous number of stars just thrown anyhow, and left lying about. Everything is held in its place, or at least has its path determined by great forces outside itself." 2

In chapter two we had many evidences of the order and precision in the universe. The rule of all the universe is motion--regulated motion. The enormous power, of which we see many evidences continually, is under firm control. Not only is that true in our solar system; it is true for every star of the whole galactic system.[3] Not only is motion characteristic of the stars individually,[4] but there are indications that the whole galactic system rotates. Professor Robert Grant Aiken has been quoted as saying:

> "These motions are all so harmonious, so absolutely obedient to law, that as the analysis of our observations proceeds, we get an ever-clearer picture of a definite and orderly system. It is a universe, in my belief, with thought and more than thought within it; a universe that is the expression of the thought of an immanent infinite spirit." 5

This harmonious motion is so finely balanced that every body in the universe affects every other body in some degree. The moon that raises tides on the earth about 240,000 miles distant

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1. Jeans, op. cit., p. 7.
2. Taylor, op. cit., p. 17.
3. Jeans, op. cit., p. 202.
4. Ibid., p. 203.
5. Watkins and Gillet, op. cit., p. 74.

raises tides on the most distant of stars, too, though less in amount.[1] Jeans goes so far as to say,

> "Each time the child throws its toy out of the baby-carriage, it disturbs the motion of every star in the universe." [2]

Not only, then, is there motion but delicate balance and intricate relationships. The order, precision, and continuity which we have already noted are dependent upon this motion and this exact balance.

c. Energy in the universe

We have already noted that great forces are at work in the operation of the universe. We do not know the nature of these forces, but their presence is recognized and depended upon. We know, from the first law of thermodynamics, that energy is indestructible; that it may be changed from one form to another but the total amount must remain the same. The second law states that this change takes place downward. For instance, one million ergs of light energy can be transformed into one million ergs of heat energy, but if this process is reversed there will not be one million ergs of light energy because the process of reversal is difficult and much of the energy cannot be transformed from a lower to a higher form.[3] We have already noted in chapter two that this fact is the basis for the theory that the tremendous forces which are being used in the operation of our universe will eventually be exhausted--not that there will be no more energy, but that it will be in a form which cannot be used. Jeans says it this way:

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1. Jeans, op. cit., p. 190.
2. Ibid.
3. Ibid., pp. 306-307.

> "Energy cannot run down hill forever, and...it must touch bottom at last. And so the universe cannot go on forever; sooner or later the time must come when its last erg of energy has reached the lowest rung on the ladder of descending availability, and at this moment the active life of the universe must cease. The energy is still there, but it has lost all capacity for change; it is as little able to work the universe as the water in a flat pond is able to turn a water wheel." [1]

Whether or not we accept this conclusion as to the end of universe is not the question here; the point is that mighty forces do operate the universe and that science has discovered the law of conservation of energy. Even in Jeans' annihilation theory[2] the energy liberated by positive and negative charges of matter rushing together is not lost, but it still exists as radiation. Jeans further says, "Other considerations...point to the annihilation of matter as the fundamental process going on in the stars."[3] Nineteenth century physics had two fundamental cornerstones--the conservation of energy and the conservation of matter. If we accept Jeans' annihilation theory we must come to the same conclusion which he states, that these two foundation stones are "replaced by the conservation of a single entity which may be matter and energy in turn."[4]

The annihilation theory is one attempt to explain the source of all the necessary energy in the universe. It is significant that this amount of energy is so tremendous that scientists feel that some explanation is necessary.

Not only are great forces operating the universe, but, as we shall see, there are inconceivable amounts of energy locked within the atom.

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1. Jeans, op. cit., p. 309.
2. Ibid., pp. 175-181.
3. Ibid., p. 176.
4. Ibid., p. 178.

d. Summary of evidences from astronomy

We have noted that the universe is inconceivable in size, that it is orderly, exact, and continuous in its motions and relative positions, and that great forces are at work keeping it perfectly balanced and timed and in perfect organization. All these things science gives us, but we need a further answer. If we stop here we are facing even greater mysteries than before, and without belief in God these mysteries confound us. If we believe in God, then the universe "becomes the expressive word of a Creator."[1] Having seen some of the facts which science offers, we are compelled to postulate a Creator. Some of the most significant statements on this point come from Jeans:

> "...there is rather distinct evidence of a special creation of stars at about the time our sun was born." 2

Again he says:

> "...the present matter of the universe cannot have existed forever: indeed we can probably assign an upper limit to its age of, say, some such round number as 200 million million years. And, wherever we fix it, our next step back in time leads us to contemplate a definite event, or series of events, or continuous process, of creation of matter at some time not infinitely remote. In some way matter which had not previously existed, came, or was brought, into being.... If we want a concrete picture of such a creation, we may think of the finger of God agitating the ether." 3

It is not to be overlooked that he says further that if we go back in time as far as we can, we do not come to the creation of the picture itself, but only to the edge of it because "the creation of the picture lies as much outside the picture as the artist is outside his canvas."[4]

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1. Taylor, op. cit., p. xi.
2. Jeans, op. cit., p. 314.
3. Ibid., p. 316.
4. Ibid., p. 317.

We have seen much evidence that this is not a chance universe; that it is not only in accordance with a plan but that it is the product of the mind of God. We know that consequences cannot be greater than antecedent causes, so the thoroughness and completeness and complexity of creation indicates the ability of the Mind behind it.

Astronomy has given us evidences that there is a Creator who is not bounded by time and space and whose work is beyond our comprehension and perfect in every detail. In astronomy we get a good picture of the power of God at work in great sweeping strokes, infinite in every sense.

2. Evidences from atomic structure

a. Minuteness and complexity of the atom

We have already noted something of the structure of atoms and the limitations of science to determine the nature of matter. As we probe still further into this field we find startling evidences of design and purpose. Atoms are complicated beyond imagination, even though they are so small that 150,000,000 of them side by side would make only an inch.[1] Or if we take the next unit in size, the molecule, some of them containing as many as 20,000 atoms, we find that they are still so small that no microscope can reveal them to us.[2] Sir James Jeans says that one pint of water contains enough molecules to cover every square inch of the land surface of the earth with 100 million molecules.[3] And yet, in spite, of the minuteness of the atom, each one is really a solar system in miniature.

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1. Greenwood, op. cit., p. 23.
2. Ibid. p. 49.
3. Jeans, op. cit., p. 90.

The complexity of atoms varies for different substances. The simplest is that of hydrogen, which has a nucleus of one proton with one electron revolving around it, as the earth revolves around the sun. Hydrogen is the only atom that has no neutron. Helium, next to hydrogen in simplicity, has a nucleus of two protons and two neutrons, with two electrons revolving around it. Any periodic table[1] will show that as we go from hydrogen, which has an atomic number of one, to uranium, having an atomic number of ninety-two, there is a definite progression in weight, complexity, and characteristics. The periodic table shows that the atomic world is not one of chance. This table shows relationships which make clear that in these miniature solar systems as well as in the galactic systems there is definite order, precision, and complexity beyond our comprehension. Jeans says:

> "We appreciate only half of the infinite richness of the world around us until we extend our survey down to the smallest units of matter. This survey has been first the task, and now the brilliant achievement of physics." 2

b. Strange behavior of the element carbon

In the periodic table of elements carbon is in the central group, with the atomic number of six. It is not the number that makes it significant; it is the organization and variety that makes us wonder at this marvellous element. Carbon is in every living thing--the vehicle, we might say, of life. We have already noted[3] that there are more than 300,000 carbon compounds. "A biologist cannot even conceive a single living cell without it."[4] The

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1. A periodic table may be found in the back of almost any chemistry textbook.
2. Jeans, op. cit., p. 86.
3. Ante, p. 26.
4. Greenwood, op. cit., p. 45

molecules of carbon are very complex and are usually arranged in long chains or closed rings. Its great variety in forming compounds indicates its peculiar capacity. Its behavior is so completely unexpected and so different from other elements that this within itself would tend to show that the capacities of this strange element cannot be accidental. Eddington has been quoted as saying, "...the element carbon rebels against limits."[1]

In the periodic table there is a great jump between boron, number five preceding carbon, and carbon itself. After that there is a gradual, orderly march up the scale. This cannot be by chance, that the one element contained in every living thing should be the one exception to the behavior and capacities of all other elements. Eddington refers to carbon as the "mysterious integer six."[2]

> "It is mysterious, and one may venture to say that investigation is never likely to reveal to us why carbon should stand so uniquely alone. The mystery of carbon in its association with life is far more profound than is the mysterious behavior of radium; for it lies at the very core of the existence of that palpitating, pulsating, entity we call life...." 3

c. Energy in atoms

In an atom, which, after all, has been resolved into charges of electricity, we would expect to find great energy. Such is the case. Jeans has been quoted as saying that if we could release all the energy in one pound of coal the amount would be equal to all the energy ordinarily obtained by burning the five million tons of coal mined each week from the British Isles.[4] Another statement concerning this great energy locked within the atom is that there

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1. Greenwood, op. cit., p. 176.
2. Ibid., p. 45
3. Ibid., pp. 45-46.
4. Taylor, op. cit., p. 35.

is enough in a single drop of oil to take the Mauretania across the Atlantic.[1] A third illustration is given by Professor J. A. Thomson--that if we could annihilate a single drop of water so that there would be only energy left it would be equivalent to 200 horse power for a year.[2] Such tremendous energy is as far beyond our understanding as is the minuteness and the complexity of the atom.

d. Intangibleness of matter

We have noted in chapter two that the nearer the approach is made to the understanding of the nature of matter the more clearly the fact stands out that matter is intangible; it has been resolved into force.

> "Whatever further disclosures are in store regarding atomic structure, we can never return to last century's conception of solid material. The whole physical universe in immaterial to the very core, as immaterial as any conception of the spiritual ever framed; waves, group waves, are the most substantial things we can find." 3

Wherever we turn in science we find abundant evidence of this fact. We have already noted that matter is charges of electricity, but nobody knows what electricity is. Basically, matter is as mysterious as spirit, for protons and electrons are invisible, intangible, and unsubstantial. These discoveries about matter have taken us step by step to where substantiality disappears and the things that seemed most real to us have melted away into intangibleness. In place of this substantiality there is an immaterial basis which physicists not only accept but which they say logical minds cannot refute. Jeans says,

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1. Taylor, op. cit., p. 35.
2. Ibid.
3. Greenwood, op. cit., pp. 185-186.

> "We live in a gossamer universe; pattern, plan, and design are in abundance, but solid substance is rare." 1

So immaterial is our universe, so intangible is the nature of matter, that "...a hundred tons of the only stuff matter contains could be packed into a pocketbook--the rest is space and such stuff as dreams are made of."[2] More and more we see that the constituents of the atom, whatever they are, are not material in the sense we have thought of them as being, and that they are not the ultimate reality. They are the results of something else which is deeper than themselves, that which not only produces them but also maintains them. The final judgment of science upon this matter may be summed up in the words of Dr. Greenwood:

> "Atoms are configurations, complicated beyond imagination, but there is no substance, no 'stuff' in their make-up. It is the organization that is the important feature and not material. Their immateriality is so striking that we may look upon them as spiritual in nature rather than material. And this is the basis of the whole physical cosmos!" 3

e. Summary of evidences from atomic structure

What we have found in the atom is that, here in the heart of what is apparently material, there is the presence of what may be termed spiritual. The minuteness and complexity of atoms indicates that this universe is complete and orderly even to the least detail. The unique behavior of the element carbon, so essential to life, is evidence within itself that such a significant thing did not happen by chance. The inconceivable amount of energy in the atom is another evidence that the whole universe is bound together by forces far greater than we know. For all these evidences there can be only one

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1. Jeans, op. cit., p. 103.
2. Macfie, op. cit., p. 48.
3. Greenwood, op. cit., p. 39.

complete answer.

3. Conclusion

From these representative evidences chosen from the many which science can give us, there can be only one logical and ultimate conclusion--that behind all these wonderful things, both in the far reaches of space and in the atom, there is God, both as Creator and as Sustainer. As the horizon of our knowledge is pushed further outward we must finally come to this conclusion, for no other is adequate to explain the facts which science has discovered. The cosmos is being revealed

> "...as one continuous flow of correlated events, both physical and spiritual.... Progress in knowledge has brought us to where we can envisage the whole stream and recognize it as God." 1

Our universe is so ingenious, so intricately linked together, so logical, and so complex that it would be absurd to believe that it happened by chance. The logical cannot come from the illogical. The rationality in the universe makes God a necessity.

> "It is a detailed Creation, finished with the utmost thoroughness, explicit and intelligible at every point, eloquent of a Thinker refining the details of his work to the utmost, giving to each least touch its character and its part to play in the whole." 2

In all this we cannot fail to see two of the great characteristics of the mind of God--the magnificent sweep of it and the infinite care in details. It is no wonder that Voltaire said, "If there were not a God it would be necessary to invent one."[3] Not only must there be a God, but we would go even further and say with

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1. Smyth, op. cit., p. 159.
2. Taylor, op. cit., p. 37.
3. Macfie, op. cit., p. 72.

Leibnitz, "Actualia dependent a Deo, tum in existendo, tum in agendo" --"not only the existence but the activities of things depend on God."[1] When we have come to this conclusion, the origin of our universe, its present operation, and its future are not matters of concern to us; we have found the ultimate answer and we are satisfied.

C. Implication of immortality

1. Evidences from biology

a. Cellular structure

We have already been made aware of the fact that life is something more than an element, more than the constituents of the cell, which are measurable because they are quantitative. Life is qualitative and cannot be reduced to a mere quantity; therefore, it eludes the analyst.

> "No single organic function has yet been found explicable in purely mechanical terms; even such relatively simple processes as the secretion of a tear or the exudation of a drop of sweat elude all attempts at complete explanation in terms of physical and chemical science." 2

We know that there is life in the cell, and the biologist tells us that protoplasm is the physical basis of that life, but life itself is the mystery. "Certainly it (the life principle) is not a mere chemical compound."[3] In terms of the cell with its constituent elements, life is a plus element. We must remember that the tests which apply to matter do not apply to life itself; neither do the functions of all living things apply to matter within itself nor do they apply to energy. Whatever this life principle is, we know that it is the force which builds the organism and unifies it, controlling

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1. Macfie, op. cit., p. 72.
2. Greenwood, op. cit., p. 98--quoting William McDougall.
3. David Heagle: Do the Dead Still Live? p. 25.

its activities. In this sense there is connection with the material elements, but, since this is only a partial connection, the death of these elements would not mean the death of the life principle also.

> "It (the soul) is indeed connected with the nervous system, or we may say, with the entire body, but only in an external way. It uses both of these structures only as a means for accomplishing its purposes, but it forms no part of them." 1

Not only does this partial connection deny the death of the life principle in the death of the cells, but there is another reason why that cannot be so. There are constant changes in the material substances of the body so that within repeated cycles the whole body is made completely new. That the life principle does not change is evident, for it is the constant factor which makes possible the renewing of the physical. From the basis of these two facts alone, we know that life, whatever it is, is of necessity an extra-cellular entity, a plus element, only partially connected with the material elements of the cells, and that it is neither by nature nor function under the laws which govern the cells themselves. Rather, it is the governing force itself, for when the animating presence of life is withdrawn from the body the cells cease to exist, returning to dust.

b. Evidences from the law of biogenesis

As we have already noted, there can be no life except from life. This is a fundamental law of biology. Pasteur, Tyndall, and later Dr. Bastian, made many experiments to determine whether spontaneous generation is possible. Their experiments served only to emphasize the law which had already been stated by Harvey. Even if spontaneous generation were possible the mystery of what life is would not be solved. Though we do not know what life is, we do know

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1. David Heagle, op. cit., p. 60.

that it must come from already-existing life and that, in nature, it must have some of the characteristics of the life from which it came. The chief characteristic is immortality.

> "Nothing is so certain as the fact that life, as it left the hand of its pristine source, was immortal...." 1

Biology continually bears testimony to the fact that immortality is sound scientifically.

> "...among the earliest forms of life, apart from accidental occurence, there is no such thing as death. We can fairly say without fear of contradiction, once attain to livingness in those early times, then immortality was not only assured, it was inevitable; there was actually no escape from it in a normal way. The significance of all this is plain enough, that the idea of immortality is not the foolish, fantastic rationalization of the wish-fulfillment; it is a scientific actuality." 2

There is still another implication in the law of biogenesis--the uniqueness of human personality. The main difference between human beings and other living things is not physical, because we are made of the same chemical elements and of cells basically similar. The difference is in the nature and quality of the life. There is nothing as unique as human personality, both in origin and in manifestation. In the same way that life comes from life, this unique personality of the human being must also have a like source. That source can be none other than God, for personality cannot be explained in any other way. That God is the source of our life is evidenced by the fact that our souls are delighted with divine things. As personality develops it "grows more and more creative, for it is approaching more and more to the Personality that is the source of it all."[3] Since God is the source of our life it is a

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1. Greenwood, op. cit., p. 156.
2. Ibid., p. 151.
3. Ibid., p. 126.

part of Him, and, therefore, immortal because He is immortal.

3. Evidences from physics

a. Conservation of matter

As we have noted, Jeans' annihilation theory would replace the old conception of the conservation of matter and of energy with the conservation of one entity, which might be matter and energy in turn. However that may be, the fact remains that there is no destruction of that which exists as a reality. It may be changed but cannot be destroyed. The annihilation theory does not change this fact. We need no proof that the soul exists as a reality; we already know that. Then this law of conservation applies.

> "It (the soul) is not a mere insubstantial something, or an abstraction having no concrete reality connected with it; but it is just as real, just as actual, and just as substantial in its being as is matter. To be sure it is not a material entity, but a spiritual one, and being such, it is, as said, both substantial and real." 1

b. Conservation of energy

We know that the soul is a force because it can act spontaneously itself and is capable of causing other agencies to act. It uses the powers of nature to accomplish its purposes, and we may correctly think of it as the greatest force we know. Since the law of conservation applies to the natural forces which are used by this spiritual force, how much more surely this law applies to the most necessary force of all.

> "...this is the great chief energy of all energies, and therefore if any power is to be considered eternal in its being, surely this mind-power must be so considered." 2

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1. Heagle, op. cit., p. 37.
2. Ibid., p. 38.

Analysis leads us inevitably to the conclusion that, after all, energy is an ultimate reality, and when we say that energy by its very nature is indestructible we are in the same breath saying that the soul is immortal.

3. Conclusion

In the light of the evidences which we have seen from biology and from physics we must conclude that life is the gift of God the Creator, and that since it came from Him it is immortal both in its nature and in its relationship to existing laws. If we say with Jeans that the physical universe is like the thought of a mathematician, we must inevitably come to the conclusion, also, that the living cell is the product of a living agent acting upon it. That agent could have been no other than God; therefore, life is from Him.

> "Life...is the climax of creation. The blossoming of life from the dust, whether the inevitable consequence of a series of chemical changes or of 'breath from the nostrils of God' was certainly, is certainly, one of the most marvelous phenomena the universe can show." 1

That which is divine cannot be also mortal but must of necessity be immortal. In the solution of the problem of life, God as the Creator and Sustainer is the only answer that gives life significance and meaning. In acknowledging that, we are stating the fact of immortality, for that which is fulfilled and made meaningful only by the immortal must itself be a partaker of immortality.

D. Religion as the final solution to the problem of wholeness

1. Inter-relation of body, mind, and spirit

> "A man's body is a beautifully co-ordinated complex where every cell is bound to every other cell...and a man's personality is equally a co-ordinated complex, and must be

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1. Macfie, op. cit., p. 76.

developed as a whole and act as a whole." 1

The original meaning of the word "health" is "wholeness," and we cannot take that to mean either body or mind or spirit alone, but all of them together, for they cannot be separated by nature nor by activity. There are many evidences that this relationship is a close one. From the standpoint of psychology, we know that the impulses and ideas that come into the mind have a tendency to find bodily expression.

> "So delicately balanced is the mechanism of this clay that it responds at once to what is before the mind. We cannot explain the relationship, but the influence of mind on body is a normal everyday fact of experience." 2

This is a fact that doctors use to great advantage in the treatment of their patients. "Every psychologist and every medical man will agree that in all sickness there is both a mental and a material element."[3] Since both of these elements are in all sickness it is very difficult to distinguish between diseases that are psychogenic, caused by the mind, and those that are physiogenic, caused by some disorder of the body.

This inter-relationship is illustrated by what Dr. Edward Weiss says in a recent magazine article:

> "It is generally acknowledged by the average physician that about one-third of the patients who consult him have no definite bodily disease to account for their illness." 4

Dr. Weiss said that he studied the cases of 200 consecutive patients, classifying them into three groups: illnesses caused by emotional problems, those caused partly by emotional problems, and those in

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1. Macfie, op. cit., p. 76.
2. E. S. Waterhouse: Psychology and Religion, p. 125.
3. Ibid., p. 133.
4. Edward Weiss: "Psychosomatic Medicine"--The American Journal of Nursing, March, 1945, p. 189.

which emotional problems apparently had played no part. In the first group there were 35 percent, in the second group 33 percent, and in the last group 30 percent.[1] On the basis of this, then, we may say that probably more than 60 percent of all illness has a definite mental factor as a partial cause. It is apparent that, to some extent at least, the body is the partner that is under the control of the mind and spirit.

Professor McDougall, psychologist, has been quoted as saying:

> "Successful therapeutic suggestions and actions that effect definite tissue changes are especially significant....In all such cases we have definite evidence of control of bodily processes which, though unconsciously effected, must be regarded as psychical. Of the limits of this power of mental control over the organic processes of the body we are altogether ignorant, and new evidence, most of it ill reported and therefore valueless, but much of it above suspicion, repeatedly warns us against setting up any arbitrary limit to what may be effected in this way." [2]

It is evident then, that in this close relationship the mind and spirit are the controlling powers and that they affect the body either negatively or positively. That being the case, our first concern is not the body primarily, but that which controls it. "When the inner peace and trust of the heart has perished, then worry and fear are bred, which are the causes of diseases of the nerves, the digestion, the skin, and the mind."[3] If this is true, how much greater should be the positive effects of the right emotions! Nature herself is positive and if unhindered moves in a positive direction; consequently, that which also is positive is in alignment with her

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1. Edward Weiss, op. cit., p. 189.
2. Worcester and McComb, op. cit., p. 258.
3. Victor Herbert Lukens: God Works Through Medicine, p. 83.

purposes and adds to her positive accomplishments.

> "I have never ceased to be surprised at witnessing marked physical improvements which have followed the release of the soul from anxiety, fear, a sense of inferiority and condemnation, or as the result of a new and more serene spiritual life." 1

The whole crux of the matter, then, is that the mind and spirit are basically the controlling powers and are of primary importance in the question of health.

2. Effects of emotion

a. Negative effects

Bodily responses to great emotional disturbances are very marked. Dr. Walter B. Cannon describes such a response in this way:

> "The contraction of blood vessels with resulting pallor, the pouring out of 'cold sweat,' the stopping of saliva flow so that the 'tongue cleaves to the roof of the mouth,' the dilation of the pupils, the rising of the hairs, the rapid beating of the heart, the hurried respiration, the trembling and twitching of the muscles, especially those about the lips--all these bodily changes are well recognized accompaniments of pain and great emotional disturbances, such as fear, horror, and deep disgust." 2

As we have observed, nature is positive and whatever is negative runs counter to natural laws; consequently, the results are not in harmony with nature's intentions. This basically, is the reason why negative emotions make us ill.

The gastrointestinal tract is the chief place where emotions cause great disturbances. It is a very common experience to have the flow of saliva stopped by excitement or fear, but this is a minor disturbance. There is also a decrease in the secretion of gastric juice, the pancreatic juice may be stopped, and the secretion

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1. Worcester and McComb, op. cit., p. xiv.
2. Walter B. Cannon: Bodily Changes in Pain, Hunger, Fear and Rage, p. 3.

of bile checked.[1] This means that every juice needed in the digestion of food, except intestinal juice, may be either checked or stopped by emotion. It is no wonder that food in the stomach of the emotionally upset person is like lead.

> "The conditions favorable to proper digestion are wholly abolished when unpleasant feelings such as vexation and worry and anxiety, or great emotions such as anger and fear, are allowed to prevail." [2]

Not only are the necessary digestive juices stopped or checked, but the motions of the stomach are affected, and the peristaltic movements of the most of the alimentary canal are stopped entirely as the result of great excitement.[3] Many experiments have been made on lower animals, particularly on dogs, to see what the results are in times of great emotional disturbances. The conclusion to these experiments is this:

> "There is no doubt that...gastric and intestinal peristaltic waves are stopped in man as they are stopped in lower animals, by worry and anxiety and the stronger affective states." [4]

We may reasonably say that the effect will be even greater in man because his nervous system is much more highly developed and his whole body more complex than lower animals.

In addition to these disturbances in digestion, other harm-results, also, are produced. Whereas digestive glands are slowed down other glands are stimulated to overwork. In pain and deep emotion the adrenal glands secrete excess amounts of adrenin into the blood. Dr. Cannon goes so far as to say:

> "Great grief and prolonged anxiety during a momentous crisis

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1. Cannon, op. cit., p. 13.
2. Ibid., p. 9.
3. Ibid., p. 14.
4. Ibid., p. 16.

have been regarded as causes of individual instances of diabetes, and anger or fright has been followed by an increase in the sugar excreted by persons who already have the disease." 1

In the article to which reference has already been made,[2] Dr. Weiss mentions several results of emotional disturbances, such as atypical neuralgia, nausea, vertigo, and others,[3] and says that these are only the attempt of the body to express emotional tension.

There are many other results of emotional disturbances. Partial paralysis may be caused by fear or hysteria. In some chronic diseases, such as certain types of arthritis, worry is recognized as a contributing factor or even as the total cause.

Not only may specific illnesses be caused but there may, also, be a harmful general reaction. Disharmonies between reason and impulse, between conscience and inclination, cause inner conflicts that sap the energies. Negative living in any sense is destructive to body, mind, and soul. Frequent suggestions of weakness, discouragement, and unhappiness make of our lives a feeble, sad picture of failure, to which may be added many physical disabilities.

b. Positive effects

We have already noted[4] the results when the soul is released from fear, worry, a sense of condemnation, and other negative emotions. Release comes only when we turn from ourselves to God, letting our lives become God centered. If we try to live within ourselves we are anxious and troubled, burdened with the guilt of sin and with all the other evils of self-centered living; but when we give ourselves into His keeping He meets every need of the human heart--the need for

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1. Cannon, op. cit., p. 67.
2. Ante, p. 52.
3. Weiss, op. cit., p. 191.
4. Ante, p. 54.

forgiveness, for peace, for guidance, for security. Through this release, the weakness, the stagnation and staleness, the failure, and the unstableness of self-centered living changes into a new, vigorous life, challenging and uplifting, stabilized in God.

When we turn to God, so that this release is possible, we are doing that which every psychologist knows is best for human life--reaching out to that which is outside us and greater than we. The psychologist is concerned, first of all, that the person with whom he deals should transfer his problems in order to find release from them; but if this transfer is only from the patient to the doctor, as is often the case, the problem of over-long dependence arises. For the Christian psychologist there is only one difficulty--the transference of the problems from the patient to God. In this act there is wholesome and healthful release, and the greater the dependence upon Him the better are the results. Modern medical science bears testimony to the truth contained in the words of Jesus, "...whosoever would save his life shall lose it...."[1]

In this positive approach to life we are working in harmony with natural law and the way is open for the healing of body, mind, and soul. Natural law is the law of God, the vehicle through which He works. Instead of the poisonous hatred, fear, and bitterness of negative living, the positive approach is one of love, trust, and goodwill. All these are in alignment with natural law and are, therefore, means of bringing us strength.

3. Health-giving values of religion

As we have just seen, there is great therapeutic value in

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1. Mark 8:35.

release from the evils of negative, self-centered living. To be cleansed from the guilt and freed from the burden of sin, to know the comfort of peace with God and with ourselves, to feel the security of His care and love, to lose our lives in Him only to find them again, made new, fuller, and richer--these are the experiences that give health to body, mind, and soul.

Also, as we have observed, that which aligns itself with natural law is an aid to health. There is no greater parallelism than that between natural law and religion. Within every person there is that which is potentially responsive to God or to manifestations of Him. In chapter two our authors mentioned the awe-inspiring sight of the sea of leaping flames around the sun. The awe and fascination which we feel in the presence of wonderful and beautiful things are some of the non-rational elements in every religious experience. Since these elements are fundamentally a part of every human being, it is clear that in religion we are placing ourselves in a position where the great healing and health-giving forces of nature may come in. We have seen that the body needs positive stimuli; how much more true that is of the mind and spirit! "It is the power of religious emotion, which when awakened and directed, can work wonders of healing, otherwise impossible."[1]

We have already concluded that life must be a gift from God. Then the logical thing to believe is that we must put ourselves in correct relationship with Him before that life can be fully kept in His original intention.

> "Perfect health results when the inflowing life...is received fully and freely. This is possible only when His laws are

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1. Worcester and McComb, op. cit., p. 349.

> observed on both the natural and the spiritual plane...Even more essential than care of the body on the natural plane is the observance of the laws of God on the spiritual plane. Since life flows into the body through the soul, the body can receive a full normal influx only when the life of the soul is in accordance with spiritual laws. Even the people who do not understand this truth recognize the tremendous influence which the mental state exerts upon the bodily condition and emphasize the importance of encouraging only kind and elevating thoughts and of cultivating a serene spirit." 1

It is not enough for us to say that there are spiritual laws; we must prove it. That may be done by showing that if the conditions which are laid down are fulfilled the results will be moral health and general well-being. Just how this takes place we do not know, but it is evident that the healing force is there.

> "In addition to the doctor's remedies, believers may put to use a special curative force from God...It is as real as the power of any drug or other remedy used by the doctor, or as any of the forces of Nature." 2

This healing force, whatever it is, comes from without, as a separate entity, apart from anything which may be supplied by a human being and different from every other force. To the power of this force many medical men in various fields testify. Dr. Richard C. Cabot has been quoted as saying,

> "It (religion) is the most searching, inclusive, and profound activity possible for the individual, since it reaches to the depths of personality and frees its most powerful motives." 3

Paul J. Mobius, European authority on psychological medicine, "felt that religion was so essential to the preservation of mental soundness that he considered its decline, in modern times, to be one of the causes of the prevalence of mental and nervous breakdown." 4

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1. Horatio W. Dresser: Spiritual Health and Healing, pp. 86-87.
2. Lukens, op. cit., p. 18.
3. Worcester and McComb, op. cit., p. 307.
4. Alexander B. MacLeod: Mental Hygiene as Taught by Jesus, p. 125.

Modern medicine is learning that in a large group of disorders the only method which promises success is to attack the illness from the mental and spiritual side. For this reason there is less dependence on drugs and more dependence on the forces of nature. This is true not only in functional illness but also in certain diseases organic in origin, and in both types general admission is now made that the mental condition of the patient is a great factor in his recovery.

Dr. Jung has been quoted as saying:

> "One can easily understand what it means to a patient when he can confide his experiences to an understanding and sympathetic doctor. His consciousness finds in the doctor a moral support against the unmanageable effect of his traumatic complex. No longer does he stand alone against these elemental powers, but a trustworthy man reaches out a hand, lending him moral aid in the battle against the tyrannical oppression of the uncontrolled emotion." [1]

This, in a greater sense, is what religion does for the person who is ill. There is a feeling of comfort and security which nothing else can supply.

More specifically, let us see what are some of the values in prayer. William James quotes Dr. Thomas Hyslop as saying in a speech to the British Medical Association that the best sleep-producing agent his practice had revealed to him was prayer. "I say this," he said, "purely as a medical man."[2] William James himself said that prayer for the sick "should be encouraged as a therapeutic measure. Being a normal factor of normal health in the person, its omission would be deleterious."[3] H. G. Wells has been quoted as

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1. Worcester and McComb, op. cit., p. 303.
2. MacLeod, op. cit., p. 128.
3. Worcester and McComb, op. cit., p. 315.

follows:

> "Prayer is a power. Here God indeed can work miracles. A man with the light of God in his heart can defeat vicious habits, rise undaunted after a hundred falls, make headway against despair, and thrust back the onset of madness." 1

Prayer is a unifying force. The mind is turned from the struggles and confusion within itself toward God and centered on Him so that the personality grows more harmonious as the inner conflict is resolved and the soul is aware of new strength and blessedness. Thus instead of driving back into the subconscious mind the feelings of guilt and of pain or remorse, the person who prays brings all these things out into full consciousness and views them in the clear light of God's presence. In doing this there is great release and a new sense of freedom. In this way it is clear that

> "Prayer is a power which sets free an energy to discharge itself in new channels and to minimize the processes of disease till the man is cured." 2

It is a recognized fact that, other things being equal, the sick person who prays for himself and for whom others pray, has a better chance to recover because of the stimulating hope which prayer bestows. The comfort and peace which come as a result of being united with God are aids in the process of nature's healing. In both functional and organic disease prayer is a curative agency. Knowing that, it seems as unscientific to believe in medical treatment without prayer as it is irrational to believe in prayer alone.

Professor Hocking says, "That which can happen only with a consciousness of God is an act of God."[3] Therefore, prayer is an

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1. Worcester and McComb, op. cit., p. 304.
2. Ibid., p. 307.
3. Worcester and McComb, op. cit., p. 299.

act of God, drawing us near to Him that we may find in Him our life and strength. Through this open door of prayer, light and life and power come from Him into our lives, binding up that which is broken and healing that which is ill. Without prayer we are lonely, restless, with inner confusion and division; through prayer there is a deeper peace than even our greatest need.

There is no negative factor in prayer--no fear, no vindictive impulse, no hatred, no bitterness, no worry; on the contrary, the very act of prayer is a positive act. For this reason, prayer is one of the greatest factors in the integration of our whole being.

4. Conclusion

Since religion is positive, there is healing in it. Its optimism and absence of fear are a balm to the mind, especially to an ill mind. As it reaches out, power and goodness lift it up and give it strength and wholeness. The simplicity, courage, faith, and peace in the teachings of Jesus contribute to mental and spiritual health and through the mind and spirit to the health of the body. Jesus knew human nature intimately, and because He was in daily contact with the sick in mind and body there is a therapeutic quality and value in His words. There is healing in them, not merely for those to whom they were first spoken, but, also, for us today. What can better restore the ill or keep in health the strong than His words, "Come unto me...and I will give you rest"?[1]

The time must come when the body, the mind, and the soul will be treated together, and the doctor of medicine, the psychologist, and the minister will unite in the ministry of healing the

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1. Matt. 11:28.

whole man. Christ did not make a rigid distinction between sickness of the body and of the soul. They were both treated as one great illness of humanity. To the Greeks His distinctive name of "Savior" meant "Healer," and His work was to make men whole. In every personality there are disparate elements which may become so significant that the personality becomes a divided one. "A completely integrated personality is the supreme achievement of human living."[1]

E. Conclusion

In this chapter we have dealt with three religious implications which arose from our study of the scientific facts presented in chapter two. These implications are: first, that God exists; second, that there is immortality; and, third, that religion is the final solution to the problem of health. Astronomy, physics, chemistry, and biology all contributed to our study.

From all these sciences many facts support our conclusions that God exists as Creator and Sustainer; that He is the giver of life and that it is, therefore, immortal; and that only as we lose our lives in Him can there be integration and wholeness of human personality.

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1. Schofield, op. cit., p. 59.

SUMMARY AND CONCLUSION

SUMMARY AND CONCLUSION

In our study to determine the relation of science and religion as it pertains to the teaching of general science in high school, we have sought to present sufficient evidence to support the following conclusions: first, that science has limitations which prevent it from completing the meaning of life for us, and, therefore, must be complemented by religion; second, that, in spite of these limitations, every field of science has many invaluable contributions to make to religion; and, third, that modern science bears testimony to what religion has always known--that intangibles are the only realities.

The limitations of science do not prevent it from being complete in its own field, but there are many things vital to us that are not within its scope. Science can deal only with time and space relations; it "...cannot deal with questions concerning right and wrong, nor can it analyze honor or beauty any more than it can pass judgment on first causes and on the ultimate origin of things."[1] It may tell how much, but it does not presume to answer the questions "How?" and "Why?". Jeans says, "It is rare indeed for science to give a final 'Yes' or 'No' answer to any question propounded to her."[2] This is the reason why science must be complemented by religion, for religion has the ultimate answers and assurances which the human heart must have.

The contributions which science has to make to religion

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1. William M. Agar: The Dilemma of Science, p. 16.
2. Jeans, op. cit., p. 7.

are many. We have seen that astronomy points conclusively to God as Creator and Sustainer; otherwise, there is no rationality left in the universe. Physics, also, contributes to the fact that there is purpose and design in the universe, for equally as much evidence of this fact comes from the atom as from the outer reaches of space. Biology offers abundant evidence that life, mysterious and elusive, is a gift from the Creator Himself, and that, by reason of its source, it is immortal. Physics and chemistry teach us that matter, the most solid thing we know, is, after all, intangible, so that we no longer think of the real in terms of the concrete. Modern medicine sustains our belief that the integration of human personality and the wholeness of man can be achieved only when the life is God centered.

These evidences have been presented in this thesis for two purposes: first, as examples of the contributions which science is daily pouring into the lap of religion; and, second, as a basis for showing how religion may take advantage of that which science offers. This we have attempted to do by showing how religious implications naturally arise from a study of such elementary science as a high school general science textbook, and how they complete the meaning of science for the whole of life.

One of the greatest contributions to religion is the conclusion to which science has come in regard to the nature of matter. The atom which we thought was solid has been found to be empty and shadowy. Matter is not material, but immaterial; not an object to be acted upon, but a force to act. Our whole environment of space, time, and matter, which seemed so real to us, has been resolved into symbols. More and more the scientist moves out into an atmosphere that is purely mental, becoming increasingly dependent upon mathematical formulae to express what he has to say. Eddington says,

> "We have travelled far from the standpoint which identifies the real with the concrete...for example, time must be accepted to be real, although no one could attribute to it a concrete nature." 1

There is really nothing left in our universe except intangibles, and for us to refuse to admit their reality is irrational. In science there is increasing awareness of "realities which have no relation to time and space, nor ever can."[2]

As far as science is concerned, then, instead of undermining Christian faith, it supplies many wonderful supports to strengthen it. We must recognize that there is little either in the procedure of science or in its discoveries that will in any way threaten to imperil essential positions of faith. On the contrary, discoveries in science may be of equal importance to religion if we are aware of the contributions which they have to make. Christianity has nothing to fear from a true science, and needs no defense. We would do well to remember the words of Eddington,

> "Dismiss the idea that natural law can swallow up religion; it cannot even tackle the multiplication table single handed." 3

Religion has too long been on the defensive. There is a danger that our spiritual energies will be exhausted in defending a position that is not even under attack. It is true that science has made necessary certain changes in some of our conceptions, but these changes have been positive. Our conception of God as omnipotent and omnipresent "does not need to be altered in character, but it has had to be exalted in degree. The formula remains, but it is raised to a vast power."[4]

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1. Arthur Stanley Eddington: Science and the Unseen World, p. 33.
2. Kirtley F. Mather: Science in Search of God, p. 138.
3. Eddington, op. cit., p. 58.
4. Taylor, op. cit., p. 61.

Religion must also realize that truth is many sided and that no one field of knowledge has all the facts. When various aspects, taken singly, are seemingly contradictory, there is usually a reconciliation in a larger synthesis. Inevitably, this synthesis gives a more complete representation of the truth which is in God.

Then religion must go one step further and make use of the contributions of science. This is being done to some extent, but greater possibilities lie in the future. Scientists themselves place this responsibility upon the leaders in the field of religion. We might well take what Jeans says as an indication of the attitude of scientists toward the problem of interpretation:

> "The message of astronomy is of obvious concern to philosophy, to religion, and to humanity in general, but it is not the business of the astronomer to decode it. The observing astronomer watches and records the dots and dashes of the needle which delivers the message, the theoretical astronomer translates these into words...but it is for others to try to understand and explain the ultimate meaning of the words he writes down." 1

Finally, leaders in the field of religion must remember that it has a unique function to perform. The contributions of science to Christian faith are many and valuable, but, after all, "God is not to be proved; He is to be experienced."[2] Experiencing God is religion, and nothing can be substituted for it because nothing else can satisfy the human heart nor give meaning to life.

These, then, are the relationships which our study, based on a high school general science textbook, has revealed to us as existing between science and religion. It is perfectly clear that they not only can but do work together for the benefit of man. Science deals objectively with the universe in which we live; religion is

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1. Jeans, op. cit., p. 319.
2. Carver, op. cit., p. 159.

concerned that we live abundantly. Because of these relationships in which science contributes to religion and is, in turn, complemented by it, it is not only desirable but mandatory that the science teacher deal with the total problem of truth in such a way that both the mind and the heart of the student will be satisfied. A. N. Whitehead has been quoted as saying,

> "When we consider what religion is for mankind, and what science is, it is no exaggeration to say that the future course of history depends upon the decision of this generation as to the relations between them." 1

Neither science nor religion can ignore the other. Science must recognize that to its discoveries religion can add interpretative values; and, on the other hand, religion that ignores true science faces an uncertain future. We must relate our highest values, which are those in religion, with our experimental knowledge of the universe. Science and religion necessarily approach each other more closely as they move from different angles toward the common goal of truth.

> "What is required, therefore, to draw science and religion together...is the disclosure of the naturalness of the supernatural...And even as the contribution of science to religion is the vindication of the naturalness of the supernatural, so the gift of religion to science is the demonstration of the supernaturalness of the natural. Thus, as the supernatural becomes slowly natural, will also the natural become slowly supernatural, until in the impersonal authority of law men everywhere recognize the authority of God." 2

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1. Frederick Clifton Grant: New Horizons of the Christian Faith, p.52, quoting from Science and the Modern World, p. 253.
2. Drummond, op. cit., pp. xxii-xxiii.

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