

ALIVE

*An Enquiry into
The Origin and
Meaning of Life*

by

MAGNUS VERBRUGGE, M.D.
Fellow of the Royal College of Surgeons
of Canada

Ross House Books
Vallecito, California

Copyright ©1984 by Magnus Verbrugge

“You should not be disturbed if the answer is not that which you expected because, of course, you are seeking the truth rather than proof of a preconceived theoretical answer to the original question.”

**– Robert B. Salter, O.C.,
M.D., FRCS, FRCS(C),
Can. J. of Surgery
23, No. 4, Jul. 1980**

“The suppression of uncomfortable ideas may be common in religion and politics, but it is not the path to knowledge; it has no place in the endeavor of science. We do not know in advance who will discover fundamental new insights.”

– Carl Sagan, *Cosmos*, p. 91

Alive!

Chapter Outlines

PART ONE

HOW DID WE GET TO WHERE WE ARE TODAY?

Chapter I: A MATTER OF LIFE AND DEATH. Following the Renaissance the scientists of the West abandoned the belief in God as the Creator of the cosmos and life in it. That made them seek the origin of life inside of the cosmos, starting from purely physical sources. To explain this man invented the theory of ABIOGENESIS. The rejection of God also led to that of His laws for human behavior. Next, the oppression and killing of man came to be seen as legitimate if done for the greater good of mankind. And finally the death of God and the degradation of man led to the loss of all meaning for life.

Chapter II: ANIMISM: OF SPIRITED MYTHS AND MYSTERIOUS SPIRITS. The Greeks searched for the origin of life inside the cosmos. They invented spirits as the invisible forces, needed for its explanation. This gave rise to animism in various forms. For centuries Aristotle's speculations reigned supreme, even in the Christian church.

Chapter III: OF SOARING SPIRITS AND REASON. During the Renaissance new theories were formulated to explain life's origin. Surprisingly, animism appeared in new forms in spite of the rationalistic attitude among humanistic scientists. They continued to invent animistic spirits for this purpose until this very day. And most of them are not even aware of this.

Chapter IV: THE WORD OF GOD AND THE THOUGHTS OF MAN. Early Christian efforts to rhyme animistic theory with the word of God failed. Modern attempts to reconcile abiogenesis with creation also misfired. Contemporary efforts to rehabilitate creation as a scientific "theory" are discussed. How to avoid the mistake of tying unchanging, revealed truths with fallible, changing scientific theories as has been done so often in the past?

PART TWO

SOME FACTS OF LIFE

Chapter V: IN THE LAND OF THE MINUSCULE. The anatomy of living and the “organs” in the cell. The means used to investigate the incredible complexity of living things and what this does to them.

Chapter VI: THE LITTLE DEMONS OF JACQUES MONOD. Of chemical happenings inside the cell. How does it stay alive? Of speeding proteins. And who regulates the traffic? How animism crept into biochemical theory.

Chapter VII: CELL DUPLICATION AND THE “EQUIVALENT OF LIFE.” How new life gets started. DNA and the complex processes in cell division. The riddle no one can solve.

PART THREE

ANIMISM IN THE SPACE AGE

Chapter VIII: LIFE FROM THE DEAD. The new search for the origin of life in a world without God starting with Descartes and going on today. From the birth of the individual to the origin of life. The battle between vitalism and materialism. They share the animistic habit of replacing God with self-made spirits. The victory of materialism.

Chapter IX: THE LITTLE GODS OF DESCARTES. Building mechanical models of life with science fiction. How to “animate” these models with imaginary spirits.

Chapter X: THE HAND OF THE DEAD AT THE CRADLE OF LIFE. Pulling new biological laws out of the hat. The cosmic animism of dialectic materialism. Wishful thinking replaces scientific reasoning. How un-reason conquered the world of biology.

PART FOUR

WHAT DO WE REALLY KNOW?

Chapter XI: HOW WE LOOK AT THINGS. Every cut diamond has many glittering facets. When we look at physical things we experience various *aspects* of them. We ask: how “many?” (numbers), how “large?” (space),

OUTLINE

how “fast?” (motion), how “active?” (energy). All these aspects are different and yet inseparable. This novel way of looking at things opens new vistas for scientists.

Chapter XII: WHAT WE ARE LOOKING AT. The world of smallest things. The way they work together as individual entities. Confusion at the basic level: the difference between random collections and ordered systems. Once we know how to distinguish between the aspects of things we gain a clearer understanding of their functions.

Chapter XIII: THE CAPTAIN AND HIS CAPTIVE OARSMEN. Atoms in molecules, molecules in cells are captives in real systems. They have lost their individual freedom of random interaction but not their intrinsic properties. Their captor runs them with an iron hand. But he cannot change their inner nature. That would violate all established laws of physics. But he can direct and rearrange their functions in an order that serves his function.

Chapter XIV: LIFE IS VERY SPECIAL. The little particles, captive in the living cell. What rules their functions which are now determined by biological needs of a larger organism? No chemical or physical spirits are found at the molecular level to order their interactions in spite of what the materialists say. The “vital forces” of the vitalists are equally absent. The course in life of living things.

PART FIVE

HUMANISM IN CRISIS AND DEFEAT

Chapter XV: THE BATTLING SCIENTISTS. The animists of different persuasions fight each other with a fierce passion. The casualties are falling on both sides. Materialists effectively destroyed the vitalist’s arguments. Mechanists devastate their dialectical brethren and the dialecticians rout the mechanists.

Chapter XVI: THE FAILURE OF THE FOUNDATION. The theory of abiogenesis *has not been proved*. It is propped up by circular reasoning, bluff and animistic metaphors that defy all scientific argumentation. It leads to self-contradictory statements and insoluble riddles. This is beginning to disturb some humanistic biologists and philosophers.

Chapter XVII: THE WALLS ARE CRUMBLING. Some diehard humanists have started to think that abiogenesis *can not be proven*. Among them voices

are raised against abiogenesis saying it is “meaningless,” “irrelevant,” “disastrous” etc. Some now suspect that *abiogenesis is not even a valid theory*. Without its foundation in the scientific theory of abiogenesis the building of materialism is threatened with crumbling and tumbling down. The efforts of some to try and shore it up by ridiculing the opposition are in vain. They merely debase themselves in the eyes of true scientists.

PART SIX

THE WORDS OF GOD AND THE LAWS OF MAN

Chapter XVIII: WE SEE, CONCLUDE AND FORMULATE. Christians failed to found science on a coherent program that recognizes the lawfulness of God’s creation. They never expressed their belief in God’s maintenance through His laws in a scientific manner, in a “cosmomic” view of creation. Humanists are seen to be at a loss to explain the origin of these laws. That changes the rules of the game for both Christians and humanists. The Christian can now see God as the origin of the laws in the cosmos without fear of contradiction. His humanist colleague *has no alternative* to offer. Only *cosmology* can now be the guiding principle for a scientist.

Chapter XIX: CONVICTIONS OF THEORY AND THEORY OF CONVICTIONS. Once man has declared God to be dead, he needs a substitute. It is one of God’s laws for our thinking that we *must* substitute an idol for Him, which we can only take from His creation. And the major source of such idols is an aspect we abstract from a creature and promote it to the status of a spirit. That guarantees that the work of scientific humanists still rests on a religious foundation.

Chapter XX: THE ULTIMATE QUESTION: THE MEANING OF LIFE. The world of living things is of a marvelous diversity. There is a place for every little creature. Our investigation brings out the greatness of the Creator in each of them. The scientist does not find a “purpose” such as the urge to perpetuate the individual or the species in creatures that cannot think. That is pure fantasy. Nor is man’s life as purposeless as the rolling of the croupier’s ball on a roulette. (Monod) That too is fantasy and of a degrading kind. Our spiritual rebirth through faith in our Creator finally frees us to cleanse science of all animistic spirits. And so we can devote all our efforts, including those in science, to fulfill our true purpose in life by seeking the honor of our Creator, our Origin. That re-establishes the real *meaning of life*.

Alive!

Annotated Table of Contents

i FOREWORD Dr. Rousas John Rushdoony

iii INTRODUCTION

PART ONE

HOW WE GOT WHERE WE ARE TODAY

1 Chapter I: A MATTER OF LIFE AND DEATH.

The rejection by science of God as the Origin led to theories that often facilitated and even encouraged the deliberate destruction of human life and to the view that life is nothing but a special case of matter in motion.

9 Chapter II: ANIMISM AND EARLY SCIENCE.

Early pagan religion in Greece sought to explain the origin of life through various forms of *animism*, by ascribing creative power to “spirits,” i.e. either concrete things or abstract human concepts.

15 Chapter III: OF SOARING SPIRITS AND REASON.

From the Renaissance till today “hard” science has progressed spectacularly by shedding Greek mythology and at the same time the theories on life’s origin have remained bound by modern versions of Greek animism, from Descartes onward.

23 Chapter IV: IN THE BEGINNING GOD SAID...

From Augustine to the theologians of today, all attempts to accommodate the doctrine of creation to the theory of *abiogenesis* – the proposition that life originated through mere natural processes – have failed, as have Christian’s efforts to present creation as a “scientific model.” This shows the folly of tying God’s word to human theories.

PART TWO

SOME FACTS OF LIFE

33 Chapter V: IN THE LAND OF THE MINUSCULE.

Some information about the minute organs inside of a living cell and the methods we use to get it – which usually kill the cell.

39 Chapter VI: THE LITTLE DEMONS OF JACQUES MONOD.

Microbiology and the role of proteins in keeping the cell alive.

**45 Chapter VII: CELL DUPLICATION AND THE
“EQUIVALENT OF LIFE.”**

The propagation of living things and the prevailing *animistic* notions about the role, played by DNA and protein molecules.

PART THREE

ANIMISM IN THE SPACE AGE

51 Chapter VIII: LIFE FROM THE DEAD.

The rise of abiogenesis and the victory of its materialistic version over that of vitalism.

59 Chapter IX: THE LITTLE GODS OF DESCARTES.

The materialistic scenario of the “mechanists” for the origin of life and its experimental failure.

67 Chapter X: THE HAND OF THE DEAD ON THE CRADLE OF LIFE.

Dialectical materialism from Hegel through Marx and Engels to contemporary biochemists calls forth life by decree from the primeval oceans through a variation of animism: emergentism. Life refused to obey.

PART FOUR

WHAT DO WE REALLY KNOW?

75 Chapter XI: HOW WE LOOK AT THINGS.

We distinguish aspects of real things which we analyze in science but to which we may not ascribe independent existence at penalty of being guilty of practising animism.

TABLE OF CONTENTS

81 Chapter XII: THE THINGS WE'RE LOOKING AT.

The smaller physical particles form larger systems but never produce anything but complex physical systems that interact at random with other systems in spite of the desires of scientists looking for the origin of life with its required order.

89 Chapter XIII: THE CAPTAIN AND HIS CAPTIVE OARSMEN.

The theory of encapsis accounts for the order in physical systems and living beings without resorting to the animism, needed by materialism and vitalism.

95 Chapter XIV: LIFE IS VERY SPECIAL.

The unscientific nature of the theory of abiogenesis and the real nature of living things which rules out man's access to a theoretical explanation of their origin.

PART FIVE

HUMANISM IN CRISIS AND DEFEAT

103 Chapter XV: THE BATTLING SCIENTISTS.

Growing discord among materialists on the origin of life with the mechanists crying: "cosmic animism" at the dialecticians. Meanwhile the dialecticians call the mechanists: "cryptic creationists." But in reality both types adhere to a form of animism.

113 Chapter XVI: THE FAILURE OF THE FOUNDATION.

Growing recognition among scientists that abiogenesis is: 1) not proven; 2) not provable; 3) not a scientific proposition. Hence it can only be *believed*.

121 Chapter XVII: THE WALLS ARE CRUMBLING.

With the basis of abiogenesis knocked out from under humanism and its sect of materialism, it displays its real religious nature. Its honest adherents acknowledge the riddle of life's origin but retain their faith in abiogenesis.

PART SIX

THE WORDS OF GOD AND THE LAWS OF MAN

131 Chapter XVIII: WE SEE, CONCLUDE AND FORMULATE.

Only the believer in God acknowledges the origin of the laws of creation and needs no animistic explanations, so common among humanists, for current enquiry on "origins."

137 Chapter XIX: THEORY AND FAITH.

The idols of modern animistic science must be replaced with an awareness of the lawfulness God has put in His creation, especially the laws for human theoretical thinking, if we are to base science on the real world, not on animistic speculation.

**143 Chapter XX: THE ULTIMATE QUESTION:
THE MEANING OF LIFE.**

The purpose of living things is not to maintain individual or species – because no creature except man can know a purpose – but to fulfill the laws of their Creator and so to honor Him, Who gives life *meaning* as known to the only creature endowed with conscious thought: man, who was created in the image of his Creator.

151 GLOSSARY

157 BIBLIOGRAPHY

Foreword

One of history's most illuminating motives came into focus when Descartes decided to establish a new starting-point in human thought by divesting himself of all presuppositions and beginning with the human consciousness as the ultimate place of origin. His great point of genesis was *Cogito, ergo sum*: I think, therefore I am. Since then, the critique of Descartes has been extensive, but certain common presuppositions have marked subsequent philosophers, scientists, and theologians as being usually children of Descartes. Like Descartes, such men assume that they can divest themselves of pre-theoretical presuppositions; in some sense, by means of reason, intuition or empiricism and the scientific method, these men hope to attain an objective and neutral perspective. Their starting point is thus man and man's judgment.

This methodology has a very interesting origin. According to the Bible, original sin is man's attempt to be his own god, knowing or determining the nature of good and evil, and all reality, for himself (Gen. 3:5). Man declares himself to be autonomous and thus the point of ultimacy.

In terms of this approach, the philosopher or scientist seeks, like God, to begin in an empty universe: no facts, no ideas, nothing existing, *except* what he creates or verifies in terms of his own criteria. If such a scientist allows any data to "exist" in his universe, it is data confirmed by another scientist in terms of the same god-like premises. In the universe of Descartes, nothing could exist other than his autonomous self-consciousness, and then whatever that autonomous self-consciousness judged to be existent. In the similarly empty universe of the Cartesian scientist, nothing exists except that which the scientist by his hypothesis (the product of his autonomous reason) and his methodology allows.

A naive illustration may help illuminate this point. In a Western mountain area, mountain lions have long been known to exist, although, until the late 1970s, the forest service steadily denied that fact. Mountain lions had been regularly sighted, but the sightings were by "laymen." Not until a forest ranger with a degree in science saw "evidences" of the presence of a mountain lion (he did not actually see one) was it admitted or acknowledged that

mountain lions were a part of the local wild-life and not a “folk tale.” Is this science, or is it arrogance?

In Descartes’ universe, the existence of the world and of God depended upon Descartes’ autonomous consciousness. Immanuel Kant subsequently carried this premise to its logical conclusion, as did Schopenhauer. Modern science similarly has a universe that comes into being through the filter of the scientist’s methodology.

Neither Descartes nor the scientist, however, acknowledge that their methodology presupposes and rests upon a series of pretheoretical axioms and presuppositions which posit in advance the cosmos which will be seen. Such a position is a naive and non-critical one. It is ironic that both modern philosophy and modern science assume that they represent the critical and scientific spirit when in reality theirs is an amazingly non-critical and naive temper. It is non-critical because it begins with a fallacious premise, uncritically assumed and equated with ultimate truth. There are uncritical presuppositions of a radically religious (humanistic) nature in the thinking of modern philosophy and science. The self-sufficiency of a methodology is assumed, as well as its ultimacy, whereas God is seen *at best* as relative.

Such thinking has received a powerful challenge in this century. Two leading thinkers in this critical school of thought have been Herman Dooyeweerd and Cornelius Van Til. Dooyeweerd, in *A New Critique of Theoretical Thought*, analyzes the basic premises of thought. Modern thought cannot do justice to the reality perceived by naive experience because it studies things piece-meal and cannot face the structure of things. The architectonic experience which sees the diversity of moments as a totality is by-passed. Every concept rests on ideas concerning the nature of things, their relationships, and their origin. An idea of law is inherent in and presupposed by every concept as it organizes reality into a coherent unity. The idea of law presupposed by a system of philosophy and science is the motive for that culture. For Greek thought, it was the dialectic of *matter* and *form*; for medieval thought, it was the motive of *nature* and *grace*; and for modern thought, *nature* and *freedom*. Biblical faith is not dialectical nor dualistic but theistic. All knowledge has a religious motive and presupposition which moves it toward God or away from God. “Pure knowledge” which is free of religious presuppositions is non-existent and self-deception. Those who assume that a non-Christian stance means “objectivity” and a valid approach to knowledge are uncritical and naive. They insist on limiting faith and religion to formal and institutional channels and refuse to recognize the radical nature of their own religious presuppositions.

J. M. Spier, in *What is Calvinistic Philosophy?* (1953), said, “philosophy does not lead to faith, but it goes out from faith.” The same must be said of science; it is a product of a particular faith always.

FOREWORD

The failure to recognize this fact leads to uncritical science which is not really science. Hypotheses are posited in terms of a given faith, and these concepts are then called science. The result is confusion, and much that is now called science represents rather the earnest expressions of humanistic faith and piety.

Dr. Magnus Verbrugge, son-in-law of the late Dr. Herman Dooyeweerd and head of the Dooyeweerd Foundation, exposes clearly the animistic and even "occult" motives of much contemporary science, if it can be called that. Abstract powers are created in the hypotheses of these scientists to do what they will not allow God to do. These abstract powers which "account" for the world of natural phenomena are in reality idols created by these scientists to replace God. They assume that any idol has validity as long as it is an abstract, impersonal, and non-theistic force.

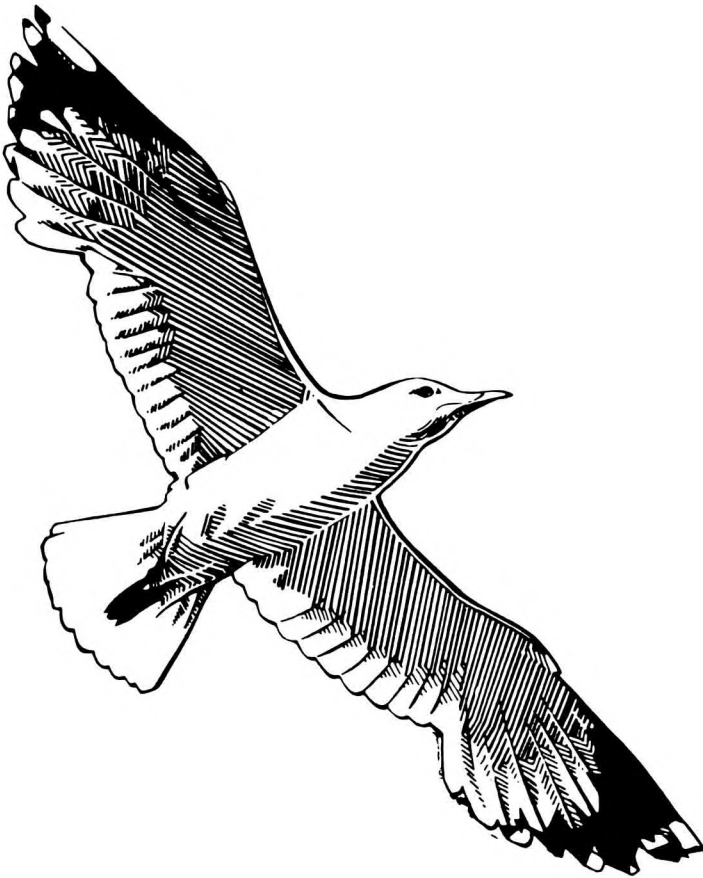
In so doing, they have robbed both life and science of all meaning. Dr. Verbrugge has aptly titled his study, *Alive: An Enquiry into the Origin and Meaning of Life*. It is an exceptionally able and telling analysis of the idolatry which now passes as science. It is a summons for the restoration of truly critical and scientific thinking. Its influence, as in time its implications begin to make their impact on the minds of men, will be far-reaching. It is thus a work of seminal importance.

May, 1984

Rousas John Rushdoony
Chalcedon
Vallecito, California 95251

How We Got Where We Are Today

Part One



A Matter of Life and Death

a. God is dead

All through history science, philosophy and religion were interwoven and often practised by the same people. Beginning with the Renaissance, men of science decided that this ought to be changed. After the church had lost its grip on them in Western Europe, they gained the freedom to pursue science as they saw fit.

An increasing number of practising scientists no longer agreed with the official metaphysics of the church. They could not accept the old speculations of the Greeks as a basis for the practice of their profession.

Galileo proposed that the earth revolved around the sun, not the sun around the earth. The church made him recant.

The circle had been the sign of perfection for the Greeks. They believed that, as a result of that, all celestial bodies moved in a circular orbit. The Christian church had adopted that notion from them. Kepler abandoned this circular motion because his data suggested that planets run an elliptical course. Copernicus said of this:

...the mind shudders...it would be unworthy to suppose such a thing in a creation constituted in the best possible way.¹

Descartes began to doubt all the old metaphysical speculations. But he had to move to Protestant Holland in order to avoid the consequences. Meanwhile, the churches clung to the wisdom of Aristotle and the rest. Scientific theories fell by the wayside, but the theologians did not budge. As a result, many scientists left the church.

As they discovered ever more facts and laws governing the cosmos, they became convinced that nothing could stop the advance of man's science. As man came to know ever more, God's power diminished in their eyes. In increasing numbers they lost their faith altogether. They no longer believed in the Creator. They declared God to be dead.

At first it seemed to be a rather simple matter to reject the belief in the creation of the universe. It merely amounted to saying: "I no longer believe in God." But they soon found out that it did not answer any of the same nasty questions that had bothered man since antiquity. These questions simply didn't want to go away.

First of all, scientists have to answer the question of what sort of agent started the universe. What produced the ingredients for the *big bang*?

Second, even with man on the premises, all kinds of things happen in which he has no hand. He never created anything nor can he sustain the universe, its material particles or its living beings. In fact, after a brief flare of living, his flame dies out, to be seen by no one again. But the cosmos goes on.

And *third*, with the all-knowing God gone, why is it that, every time man discovers an answer to a question about nature, he always has to face a host of new questions? Why is it that the number of new questions increases faster than the number of answers he finds to old ones? The more he learns, the more the mystery deepens.

The negation of God involves much more than saying: "there is no God." It amounts to a switching of one's religious allegiance. We may deny this, but the history of science demonstrates the truth of this statement time and time again as we shall see. The negation inevitably leads us to ask: "what agent has replaced God as the origin?" And the answer always betrays a new religious allegiance.

In this book we will address ourselves particularly to the question of the origin of living beings on earth. The old question of origins: "assuming that there is no God, where did all living beings come from?" must still be answered. Without a transcendent Creator beyond the cosmos, there is only one place left to look for the origin of life: it has to be inside our universe (immanent). And it has to be of non (a-) life (bios-) origin (genesis). So our scientists formulated the theory that life came "spontaneously" from non-living matter. This theory received the name of *abiogenesis*.

It is important to stress here that abiogenesis tries to explain the "emergence" of the first living being from wholly non-living constituents. And this process must be entirely governed by the laws of physics only. This theory must be sharply distinguished from the theory of *spontaneous generation*. This old notion claims that new generations of *whole* organisms continually appear from organic matter.

With God out of the picture, man knew only one agent capable of doing the job of looking for an origin. He had no alternative – he had to take on this task himself. And he had to do this without any supervision.

Belief in God as Creator is called *theism* (theos = god). Belief in man as the sole source of knowledge has quite naturally received the name of *human-ism*.

Humanists wanted to find an agent, a power, a force, anything intelligible in human terms, that would yield an answer to the difficult questions. We will explore the interesting history of man's search for an alternative to God as the origin of life in what follows.

In later chapters we will examine what happens to science when we turn away from God. It will surprise some when we find that scientists who embrace humanism do indeed hold a religious position, that it is the result of an act of faith. We will find that theism and humanism are two religions that mutually exclude each other.

Most humanists will deny that their position is a religious one. The irony of God's creation is that the man who rejects his Creator soon begins to produce a substitute god of his own making. And in the process he leaves the path of science and builds himself an idol. We will come across many examples of these man-made little gods.

The Renaissance brought a surge of scientific investigation. Gone was the idea that Aristotle had said the last word on everything. Experiments replaced armchair speculation. Mathematics, mechanics, astronomy and early physiology opened up many areas that had been neglected for so long by investigators.

We can understand why the new breed of scientists tried to avoid the metaphysics of the Greeks. The early church had used many of these speculations in order to make Christian doctrine more acceptable in a Greek environment. But the peculiar dualism of Greek mythology led to schisms within the church.

Intolerance of the opposing views that resulted led to the Inquisition, the Reformation and "religious" wars. Countless people were destroyed in the process. And meanwhile scientific progress was often suppressed by the church.

All this led to unnecessary antagonism between religion and science. Usually the confrontations were based on differences in doctrine, many of which were a direct result of the speculations of pagan Greek religion. The humanistic scientists, freed from their church connections, were not going to make that same mistake. They were no longer going to speculate. And they were also going to liberate the rest of mankind from the old superstitions that had led to so much bloodshed. For that, God had to go first.

It took scientists who still adhered to the old religion of Christianity a considerable time to get used to a science without God. Many never accepted the proposition that the investigation of God's creation must lead to conflicts with His revealed word. They felt they could pursue their work and still discover scientific truths. But eventually this became intolerable to humanists, committed to their exclusive view that "science and religion don't mix." No scientist could retain his belief in a Creator and remain a scientist. He would

merely corrupt his methods of conducting science. This had to change.

The humanists decided that it would be much easier to persuade these stubborn people to reject God if a “natural” source for the origin of life could be found. It did not take long before they thought to have it in hand with their theory of abiogenesis. If it could be proven beyond doubt, who could still deny that *God is dead*?

b. The death of man

The leading *scientists* among Protestants failed to develop a scientific program based on their belief in God who created the *cosmos* and who maintains it through His law *nomos*. They did not make *cosmonomy* the basis for their science; and so they ended up without a scientific program altogether. As a result, the *religious* leaders of Protestantism had to deal with the new theory of abiogenesis. In that way the Protestant church got back into science as if there had been no Reformation.

Obviously the church was not equipped for this task. The Protestant church leaders had nothing but bible texts to counter the arguments presented by humanistic scientists who formulated the theory of abiogenesis. Needless to say, they met with derision. They spoke a different language. Humanists and Christians talked right through each other. Often they still do today.

Many humanists have booked spectacular successes in the natural sciences. They credited their liberation from religion and metaphysics with their success. And many defenseless Christians fell into the trap. They didn't realize that the old metaphysical speculations which the church had used belonged to a pagan and not to the Christian religion. The result was tragic. Some adopted the secular vision of humanism without noticing it. Others did so with their eyes open and kept their Christian belief out of the laboratory.

Until this very day many Christians engaged in scientific work still do not realize that the belief in God as the Creator of the *cosmos* does not in any way pose a conflict with *real* science.

Modern science certainly was not developed by humanists only. Newton believed in a transcendent Creator and many important scientists were devout Christians: Galileo, Huygens, Pascal, Planck, etc. But the rapid increase in knowledge about the physical world persuaded many that science can succeed without the belief in a Creator.

Let us see how a prominent representative describes his view of the rise of humanism in science.

In his *Dialectics of Nature* Friedrich Engels gives a vivid account of how modern scientists have bit by bit tried to push God out of the picture. As he tells it, Newton restricted God's role in it to setting the solar clockwork in

motion. Secchi pushed Him out farther and only allowed creation of the primordial nebula. In the end J. Tyndall denied the existence of any created thing except emotional processes because, says Engels rather mockingly:

...after all, there must be somebody who knows more about these things than J. Tyndall.²

Soon man threw all caution into the “cauldron” and decided that life itself must have evolved from non-living matter without anything but material forces at work. And so *abiogenesis* was born. Engels shared this opinion with scientists like H. Spencer, T.H. Huxley, C. Mitchel, E.A. Schaefer, C. Darwin and his ardent admirer Karl Marx.

These men realized that abiogenesis cannot be *proven* as an historical event. So they decided that the next best thing was to try and duplicate it in the laboratory. If they could demonstrate how life *could* have arisen from inanimate matter, they would have unravelled the “secret of life.” They would then have proven that the idea of a Creator is redundant. And that would seal the fate of that “metaphysical” concept of a God.

It is the irony of our age that after so many years of humanists’ ruling our scientific institutions the results of their work had the opposite effect of what they expected. The rebellion of the nineteen sixties was a revolt of the young against the impersonal treatment of man. A scientific world ruled by physical forces does not generate compassion and morals. Everything human is submitted to the control of impersonal mechanisms.

A couple of decades earlier, the humanists had with great fanfare announced that God is dead and science was going to liberate man. Now it dawned on many that their modern humanistic version of science seemed to do just the opposite. It threatened to kill the human personality.

In their urge to bring the blessings of technology to society, the technologists endangered the balance of nature. To the astonishment of many, the science of man the all-knowing brought no salvation from superstition, oppression or any of the other evils for which the belief in God had been blamed.

Suddenly, Oriental religions began to expand. Strange cults gained adherents. Superstitions such as astrology became popular again. Meanwhile, the results of an unbridled application of science threatened the human race with extinction. And in the process it caused increasing alienation among men on a worldwide scale.

Tremendous efforts have been made to bring us into the promised land of equality and justice through the gospel of liberalism, Nazism, Marxism and other-isms, if necessary through force. No matter under what flag this gospel without God was proclaimed, it led to the regimentation by monopolistic, totalitarian regimes in some form or another. In the process we have wit-

nessed the killing of millions of unique human beings. This still goes on today.

Life has been declared to have arisen from an impersonal “nature.” Many now accept this theory as a proven fact. They believe that we are nothing but the result of physical forces acting on inanimate matter. And that led, not only in theory, but also in tragic and actual practice, and on a vast scale, to *the death of man*.

c. The death of life or the gift of God

For over a hundred years Christians have had it pounded into their ears that the reasoning of man is the source of all knowledge. *Creation* is a mere figment of the imagination, a religious doctrine. It is irrelevant for science. Anyone who wishes to practise science properly must now become rational. He must eliminate his religious prejudices from his reasoning and put them in his private closet. In science he must become a humanist. That includes the duty to embrace the theory of abiogenesis.

The fascinating question today is whether we can demonstrate that abiogenesis is a valid scientific theory. If it is not based on scientific data but rather conflicts with them, there is a problem. What if scientists adhere to it, not because of, but in spite of their experimental findings? This would show that abiogenesis was spawned by belief and not by science. What would that do to humanism? It would mean that man merely exchanged one religion for another.

We intend to show later on that the believers in human-ism do not present a united front. They split up into many sects and denominations. They disagreed on what is the major force inside of the cosmos from which all other phenomena can be derived. That gave rise to the many -isms such as materialism, vitalism, psychologism, logicism, historicism, etc. But, by abolishing the Creator, they all tended to gravitate towards the same substitute for God as the origin of life. They ended up in accepting the idea that the beginning of all life on earth was an accident on the level of molecules in the early oceans. They all needed the basic doctrine of abiogenesis.

Disagreement persisted about how the world of living beings evolved later on. But for most humanists the theory of abiogenesis became the foundation for their self-made “model” or picture of the world.

A vigorous fight broke out between people who tried to reduce all vital phenomena to physics – the *materialists* – and the *vitalists* who believed in a vital “force” which is said to give rise to living beings.

The materialists largely defeated vitalism which they rightly considered to be an obsolete remnant of Greek mythology. That left two major sects within the denomination of materialism: those of the mechanistic and of the

dialectical variety. Between them they dominate the field of biology today. They are just as mythological, as we shall see later on.

Very few Christians have ventured out into battle against materialism. They were armed with sticks against the armour of “scientific” tanks. “Science and religion don’t mix,” they were told. As a result materialism has flooded our schools, and many Christians do not know what it has done to their children. They do not understand why so many turned their back on their parents and their faith. But today things are changing.

Today many scientists have begun to doubt materialism with its reduction of the functions of life to nothing but material phenomena.

Probably most active scientists today are not aware of the religious basis for what they believe to be scientific truth. That is why materialism, a sect of the humanistic religion, could be camouflaged as a scientific “paradigm” (from the Greek: *paradeigma*: model, pattern, example; the verb: *para-deiknunai* means: to show side by side). And, as we noted earlier, many who do believe in God the Creator do not know how to rhyme their religious conviction with this clearly pagan doctrine in their scientific endeavor.

All these men and women might be open for a reassessment of materialism if we can show them that it suffers from the one flaw that is fatal in science. They might listen if we can demonstrate beyond all doubt that materialism is in flagrant conflict with the pertinent data, and that abiogenesis is a myth, that it has no basis in reality.

If we wish to reach these scientists, we must get through to them on their own ground. We must talk to them as scientists. We must discuss the theories that follow from their paradigm. We must first of all discuss the theories involving the origin of life. If we can show that all of these are devoid of scientific value, we might get their ear. This is an avenue that offers hope and looks promising.

Our Christian scientists must be equipped to show the utter weakness of the materialistic position: that it rests on a primitive religion which began in the mists of Greek mythology. When they can do that, they may be able to remove the armour from the bare frame of materialism. Once that is exposed, the stark reality will be obvious for all to see: *there is nothing* (nihil) *there*. It is the religion of nothingness – *nihilism*.

At this level humanists and Christians can face each other on common ground. It is the level where each confesses his faith in the Origin of the cosmos. That is where each looks for the meaning of his existence. Only on that level and by God’s grace can we hopefully reach other scientists and the public at large who listen to them. After all, we share our being human and our need for meaning. And as Christians we are driven to find this common ground by the love of Jesus Christ and of our neighbour.

The major goal of this book is to demonstrate that abiogenesis is science

fiction, not to be taken seriously even by humanistic scientists. Its major consequence is that life is merely a modified form of the movement of “dead” matter. Abiogenesis declares that *life is death*. In contrast, Christ brings the good news of *life*, also in science.

If we can get this message across to scientists and non-scientists alike, strange things might happen. It is a message that Christians of all denominations can bring in unison. If we can do that through a united effort, we just might shake humanism and its powerful sect of materialism on its foundations. And if that causes some scientists to reject it and look at the alternative, offered by God’s word and His love for us all, our work will have been amply rewarded. I pray that we may be found up to that task. It is said that “where there is life there is hope.” Let it be said that *where God gives life, God gives hope*. This is the news mankind needs to hear today. It is truly a matter of life and death.

NOTES

1. Carl Sagan, *Cosmos* (New York: Random House, 1980), p. 61.
2. Frederick Engels, *Dialectics of Nature*, transl. J.B.S. Haldane (New York: International Publishers, [1940] 1960), p. 177. (Hereafter cited as *Dialectics*.)

Animism and Early Science

Chapter II

a. Matter and the Spirit that gives it Form

The earliest fragments left by Greek writers show that the origin of the material cosmos fascinated them above all else. They saw matter as a *spiritual*, “animated” *power*, filled with *divine life*. It was not caused by any other principle. It was not something concrete. They saw it as an *abstract concept*. Matter had been there from the beginning. They did not know the biblical concept of creation.

The original cause of things, the *Arche*, was divine: something that “is not dependent in any sense while all else depends on it in every way.”³ This *Arche* took various shapes in Greek thinking. Often they saw it as a *spirit* behind a moving element.

Thales of Milete saw the *Arche* as water, Anaximenes took it to be air, Heraclitus fire, while Anaximander held earth, water, air and fire to be the “elements” out of which everything with an observable form arises through mixing.⁴ And for them all it was a *spiritual* power, invisible, *always moving*, responsible for the origin of all things that receive their form, only to perish again in the eternal process of becoming and disappearing.⁵

Empedocles tried to unify these various principles and described the original state of the universe as “a condition of all-unity” in the form of a “sphere” (*Sphairos*).

Thus, in the dense enclosure of harmony lies *Sphairos*, the spherical one, filled with glad pride over the solitude round about it.⁶

Democritus (5th cent. B.C.) abolished the four elements as formative principles. Instead, he replaced them with his “atoms” which could not be further divided. But they did not resemble our concept of that name at all. His atoms were *not material* but *metaphysical* entities, infinite in number, of stereometric form and indivisible.

Democritus denied his atoms real being. They were *abstractions of form, not of matter*. They were *spiritual powers that give form to matter*. Plutarch commented that these atoms possessed a fullness of being and were seen as Ideas. Democritus saw *Matter* as an entirely formless, boundless *emptiness* of being, in which chaotic movement reigns, to receive its form from matter.⁷

Primitive animists had always seen spiritual powers in *concrete* things like rocks and lightning. But these philosophers added a new form of animism. As Reinach remarks:

...Greek animism gave 'a body, a spirit, a face' even to the most abstract conceptions...It was Greece which created the images of Peace, Mercy, Concord, etc. After having endowed all bodies with thought, she *endowed all thought with bodies*.⁸ (e.a.)

Thus these Greeks saw spiritual powers in *abstractions*. Their forebears practised *concrete animism*. They practised *abstract animism*.

It is interesting to note how a modern humanist like the Russian biochemist Aleksandr Ivanovich Oparin, a self-professed dialectical materialist, sees these Greek atomists.⁹ He claims that they were among the first "materialists." And because of that they were of course the first known real "scientists."

It is clear that Oparin *fails to see* how philosophy and religion were identical to these ancient Greeks. Science as an independent activity had to wait until a later date. They saw atoms very much *unlike* we see them. They were in search of the origin of the universe and believed they found it in the realm of the *spirit*. They were in search of God. That was naturally overlooked by a scientist who does not believe there is a God.

Herman Dooyeweerd has analyzed this religious nature of Greek philosophy extensively in his *Reformatie en Scholastiek in de Wijsbegeerte* (Reformation and Scholasticism in Philosophy). This religion found its culmination in Plato, who saw a divine origin for everything and called it god (theos). It was a god of his own making. This led Dooyeweerd to write that:

It cannot be doubted that the term theos must be understood here in the monotheistic sense of Anaxagoras as divine thought (nous), who is seen as demiurg, as form-giving origin.¹⁰

Plato abstracts human thinking, elevates it as god: *it is divine*, and ascribes to it the power to create. This is a typical example of abstract animism. And his pupil Aristotle held a similar opinion of thinking as an independent being equal to god:

...for the actuality of *thought* is life, and god is that actuality.¹¹

b. What was the Matter with Matter in Greece

Like his predecessors, Aristotle began to look for the origin of things. But he was also an astute observer of nature, unlike most of the others, who speculated in their armchair. He was especially interested in living beings, and this brought him to pursue the question of the origin of life.

In keeping with the common opinion of his day, Aristotle accepted *spontaneous generation* of all kinds of whole individual animals:

...of these instances of spontaneous generation, some come from putrifying earth or vegetable matter, as is the case with a number of insects...¹²

Also:

Eels are not the issue of pairing,...nor from an egg...Eels are derived from the so-called 'earth's guts' that grow spontaneously in mud and in humid ground.¹³

And the same origin is claimed for testaceans, oysters, cockles, hermit crabs, sponges, etc. He based his conclusions on eyewitness reports and his own observations, which suggested that these living beings did not arise from parents, be it directly or via eggs.

It is important to note here that spontaneous generation did not involve a theory about the origin of species of plants or animals. Aristotle merely believed that these beings arose *individually* as a complete young organism in every new generation.

We do not hold this against Aristotle as a scientist. He did not have our sophisticated means of observing reality and accumulating data. Nor was he less the genius he was judged to be for over two thousand years because he engaged in metaphysical speculation like his contemporaries. But that does not relieve us from the duty to recognize such speculation if we wish to practise scientific enquiry. Let us spend a few minutes in examining this phenomenon.

As we saw in the previous section, the early Greek philosophers saw spiritual power in real things like air, water, fire and earth. They practised *concrete animism*.

Socrates gave that up. He no longer believed in a personified storm called Boreas and other mythical figures, as he said in Plato's *Phædrus*:

...I have no leisure for such enquiries...The reason:...to be curious about what is not my concern, while I am still in ignorance about my own self, would be ridiculous.¹⁴

But he and his pupils, Plato and Aristotle, still ascribed divine status to their own abstractions such as human reason. They declared *functions* of man such as living and thinking to be real things. They made them into inde-

pendent, invisible but real *spirits* with power to act and called them *substances*. They failed to realize that *a function cannot exist without something – a functor – that does the functioning*. It is just like acting that cannot exist without an actor.

These brilliant men gave up worshipping abstracted concepts like beauty (Venus), wisdom (Athena) and the rest of the Olympian gods. They could not yet avoid confusing functions and functors. They animated functions, made spiritual functors out of them. And in that way they still practised animism without realizing it.

It is easy to smile at all this. But are we free from such habits? We often abstract a function in our thinking as a concept. In every day speech we use nouns to indicate abstract concepts such as life as a sort of linguistic shorthand. But do we always avoid the mistake of thinking about such concepts as *if* they have a personality of their own? We will explore this interesting question later on.

Aristotle wrote extensively about the problem of life. In his book *De Anima* he searched for what makes living things different from inanimate matter. In the tradition of his age, he abstracted life, the observable *function* of what we call living things, living functors, and gave it a *being of its own*:

The body is the subject or matter, not what is attributed to it. Hence the *soul* must be a *substance* in the sense of the *form* of a natural body having life potentially within it. (e.a.)¹⁵ The soul has the power to give life to a body. In plants it is: "...an originative power through which they...grow."¹⁶

Also:

...what has soul in it differs from what has not, in that the former displays life.¹⁷

Life takes on different forms but all plants, animals and man have it in common. And in all three he calls it "soul."

It is obvious that Aristotle abstracts the life function which all living beings "display." He calls it soul and makes it into an independent "substance." And then he endows it with *power to give form to matter* and so to create living things.

And so life became a spirit in the tradition of metaphysical speculation from Thales to Plato. It was invented to describe and "explain" the origin of the cosmos and all that lives in it.

Aristotle was one of the earliest and best known of all scientific investigators. For centuries his books were considered the best source for all there was to know about nature. His use of scientific terms still exerts its influence in our day. For that reason it is important to pay close attention to what he said.

The Latin translation of the title of his book is *de Anima*. The word “anima” means breath, moving air, wind. It has been used from times immemorial as a metaphor for life and for soul because man and many animals breathe. That distinguishes these living beings from dead things which do not do so. But we still know the original meaning of “breath.”

In the Bible the words “soul” and “spirit” are often used in this manner:

Then the Lord God formed man from the dust of the ground and breathed into his nostrils the *breath of life*. (e.a.)¹⁸

Clearly it was God Who created man, made him breathe and brought him to life. It was not man’s own “anima” or breath that did it.

Aristotle knew no Creator. For him anima was a power, *inherent in the cosmos* which gave “actuality” to “a body having life potentially in it.”¹⁹ He abstracted the function of life from the functors he saw to be alive and called it soul or anima. He then assigned a separate identity to it which had power to act, to “create” a living being.

Aristotle took a function of a created thing and proclaimed it to be as god, capable of creating living things. *He confused function with functor*. But as a result he practised a sophisticated form of animism that amounted to idolatry: he put a created function in the place of the Creator. And all the while he thought he was practising science.

As we have seen, Plato elevated his thought-function to something with an existence of its own and declared it to be divine. He identified it with a divine rational principle which forms all things.

Aristotle did something similar with the life-function. And both saw their own thinking as part of that divine rational principle. It created the laws through which the world they observed was governed. They thought the world was made and ruled through the product of their own thinking. They proclaimed their thought to be the spirit that gave being and form to matter. And this is what was the matter with matter in Greece.

NOTES

3. Roy Clouser, *What is Religion?*, unpublished mss. p. 17.
4. Herman Dooyeweerd, *Reformatie en Scholastiek in de Wijsbegeerte* (Reformation and Scholasticism in Philosophy) (Franeker: T. Wever, 1949) vol. 1, p. 66. (Hereafter cited as *Reformation*). Translations mine.
5. *ibid.* p. 67.
6. *ibid.* p. 122, footnote 104.
7. *ibid.* p. 147.
8. S. Reinach, *Orpheus, A History of Religions*. (New York: Liveright Inc., 1930). p. 85.
9. Aleksandr Ivanovich Oparin, *Genesis and Evolutionary Development*, trans. Eleanor Maas, (New York: Academic Press, 1968) p. 12.
10. Herman Dooyeweerd, *Reformation*, vol. 1, p. 231.
11. Aristotle, *Metaphysics*, Bk. 12, 1072^b, 27.
12. Aristotle, *Hist. Animal.*, Bk. 5, Ch. 1, 23-24.
13. Aristotle, *ibid.*, Bk. 6, Ch. 16, 1-15.
14. Plato, *Dialogues*, "Phaedrus," 229-230.
15. Aristotle, *De Anima*, Bk. 2, Ch. 1, 18-20.
16. *ibid.*, Bk. 2, Ch. 2, 26-28.
17. *ibid.*, Bk. 2, Ch. 2, 21.
18. New Engl. Bible, Gen. 2:7.
19. See note 15.

Of Soaring Spirits and Reason

Chapter III

a. Descartes' infallible Thought

Beginning with the Renaissance, philosophy escaped from the dominance of the church and felt free to reject the confession of creation. Brought up in the scholastic tradition with its emphasis on metaphysics, the “new” philosophers felt that old Aristotle too had to go. Renee Descartes was among the most radical of these free thinkers. He began by emphasizing:

...how many were the false beliefs that I had from my earliest youth admitted as true.²⁰

In order to discover truth, he proceeded to strip away everything he was not sure of. He began by doubting it all. But something had to remain that he could hang on to:

...whilst I thus wished to think all things false, it was absolutely essential that the ‘I’ who thought this, should be somewhat, and remarking that this truth *I think, therefore I am* was so certain that I could receive it without scruple as the first principle of the philosophy for which I was seeking.²¹

He was not satisfied with having detected thinking as a function of his own “I,” the real functor. He went a step further in his “striptease”:

...I could conceive that I had no body...but yet, I could not for all that conceive that I was not...From that I knew that I was a *substance*, the whole essence or nature of which is to think, and that for its existence there is no need of any place, nor does it depend on any material thing. (e.a.)²²

Here Descartes betrays his schooling in Greek metaphysics. First, he abstracts his own thought-*function*. He then gives it substance, makes it into a *functor* and calls it his “I” that does the thinking. All the rest of him such as the “body” may need a place to live and food to eat, but that is not an “essential” part of his nature. He can conceive the “I” without it.

All Descartes does is fall into the old Greek trap he has dug for himself. Just like Aristotle, he abstracts his thought-function and assigns it an independent substance-like, invisible “spirit” or “soul.” That substance or soul does his thinking. So he, too, ends up as an abstract animist. Let us see where it gets him.

First, his new creature breaks up reality into its smallest components. This is a trick we all perform when we do our theoretical thinking. We “dissect” the object of our investigation. For example, we abstract the concept of *number* from human metabolism and with the help of chemistry calculate the number of calories we need. In the same way we can analyze the caloric effect of protein, fat, starch etc. In this way we abstract the *physical* aspect of the needs of our body. *But the body itself stays intact.*

Descartes calls this process of dissecting an object: “to pull down the house we inhabit.” Once he has done this, he has all the building blocks needed in order to rebuild it again in a theoretical manner and with great accuracy:

...in due order, commencing with objects that were the most simple and easy to understand, in order to rise, little by little, or by degrees, to knowledge of the most complex...²³

He has great confidence in what his little “substance that thinks” can do:

...we must by its means *infallibly* reach our end if we pursue it, unless, indeed, we are prevented by the shortness of life or by lack of experience...²⁴(e.a.)

And so the *infallible* thought of Descartes ascends the heavens, soaring like the “nous” of Plato, and will speak the words of law for creation.

b. The soaring spirit that lost its wings

In the footsteps of Descartes, Thomas Hobbes did the same thing in his *De Corpore*. In its foreword he described this demolition effort, and his subsequent re-creation of the world, in terms imitating Genesis I.

Leibniz discovered the differential calculus and elevated his method to a metaphysical law. Thus he could move in his “creative thought” from mathematics to space, motion, matter and life. He believed that this continuous movement of thought was based on a law of nature: the *lex continui*.²⁵ In his theory he cancelled all the discontinuities we see in reality, such as what separates number from space, space from motion, motion from energy, and energy from life.

In his mathematical models of real functors, Leibniz could easily slide over the gaps between these abstract concepts. But concepts are not functioning functors themselves which we can examine. Like his predecessors,

he confused functors and functions. And again the result was unscientific speculation. As usual, the humanistic scientist put himself up as law-giver. Such was the power man ascribed to the thinking substance which Descartes erected in his imagination.

Newton introduced the concept of forces that act between particles of matter. This led to a revival of the idea that such dynamic forces could perhaps lead to the spontaneous generation of new organisms out of organic matter. This was of course facilitated by man's freedom to think as he pleased and thus to apply Leibniz' "law" of continuity.

Georges-Louis de Buffon in France saw the teeming world of microorganisms as arising out of the organic parts of animals and vegetables through the operation of a "moule interieur," a force similar to gravity. In England John T. Needham proclaimed a vegetative force to accomplish the same thing. Both abstracted the function of life and ascribed to it an invisible, spiritual identity. Next, they fitted it out with a force which produced living things out of organic matter. In the footsteps of Aristotle and Descartes they personified their own invention and "animated" it. It was animism, the old fiction that made men mistake mythology for science.

Towards the end of the eighteenth century, the French school of materialism arose. It saw the cosmos with all that lives in it as developed on the basis of laws inherent in matter only. Its adherents popularized their ideas in l'Encyclopedie. For our purpose it is not necessary to review all the details of the further development of the materialistic philosophy. Karl Marx played an important role in its dialectical variety, and we pick up the thread with his friend Friedrich Engels.

Engels wrote *Dialectics of Nature* between 1872 and 1882, and it was published in English with a foreword by the Marxist biologist J.B.S. Haldane in 1940. Haldane points out how important Marxism is for science, including studying the problem of "individuality in biology." In fact, dialectical materialism illuminates "all events whatever, from the falling of a stone to a poet's imaginings."²⁶

Engels boldly announces his dialectics as "the science of interconnections in contrast to metaphysics."²⁷ The laws of dialectics are gleaned straight from the history of nature and man. We will have a closer look at these theories of Engels in Chapter X and discuss the role he played in the developments concerning the origin of life.

In the early nineteen-twenties, Stalin organized Russian scientists under the scepter of Engels. Ever since, the natural scientists in that country have followed the party line faithfully. Especially the biochemist Aleksandr Ivanovich Oparin has broadcast dialectical materialism in biology with great persuasive powers from 1922 on. He has played a dominant role at international conventions ever since and helped to form the reigning opinions, as we

will see. We will spend a great deal of attention on his teachings, which were still evident in his last article, published posthumously in *Biosystems* during 1981.²⁸

Abiogenesis has been adopted by scientists of different vintage such as vitalists, organicists, holists, and the mechanists and dialecticians of the materialistic faith. For all of them the first living thing arose from material particles through the operation of some force inherent in those particles. Whether that force was called “vital,” “physical,” “psychic” or something else is a matter of speculation which we will leave to the animists concerned.

All believers in the theory of abiogenesis have had to deal with the same problem involving material particles. Abiogenesis is a theory all humanists need to replace belief in creation. But materialists seem to have gained the upper hand over all other denominations of humanism in the discussions of abiogenesis.

The community of scientists will deny that materialism is a religious faith. To them it is a genuine scientific body of assumptions. To them it is a *paradigm* according to the definition of that word as revised by its inventor, Thomas Kuhn, in his *The Essential Tension*.²⁹ But we will not forget that it really is a sect of the religion of humanism.

Materialism arose in Western Europe, and Marx modified it while in England. It is therefore not surprising that Western humanists had little trouble absorbing the teachings of the German Engels and the Russian Oparin with their dialectical version of materialism as taught by Marx.

We will discover that the adoption of materialism has resulted in a barrenness in science throughout the “civilized” world. Just as matter is devoid of life, materialism is devoid of hope or meaning. It is a *negation*, nihilism; it begets emptiness in its adherents. It satisfies not. But fresh winds have begun to blow. Voices are being raised, asking for a new paradigm that offers more than empty words and spirits that have lost their wings.

c. But what is the Meaning of Words?

In science we often describe something “as if” it were another thing more familiar to us. We do this particularly when we must refer to something new for which we have no word, or when we try to describe something we do not clearly understand. Then we say: “Life is ‘like’ our breath.”

Physicists and biochemists who investigate events within living things readily use well known words from human cultural activity in order to express what they see happening. They talk of molecules that “read” and “translate” the genetic code. They “carry” messages, “transfer” information, “recognize” the substrate for enzymatic activity and “keep track” of the time of day and the number of hours the sun shines.

When we use such “word-models” we clearly don’t mean literally what we say. We use them as metaphors. But often we get the impression that some scientists get carried away by their own poetic use of words to such an extent that it sounds “as if” they really mean it. Does the average scientist realize this? Does he admit that molecules have no human properties? It will appear in chapters VI-X that many do not.

When it comes to talking about living beings, the poetic imagination of many an investigator takes over. When J. Monod describes morphogenesis – growth – and the role protein molecules play in it, he states that they have “cognitive properties.” With the help of these they “animate”³⁰ and “build” living systems. DNA molecules are often given similar functions. Paul Weiss, a biologist discussing the role of genes, objects to this type of talk:

Evidently, by consistently promoting in this manner *adjectives* to the rank of *substantives*, we have, by definition, vested genes with exclusive ‘responsibility’ for organization and order in an organism.³¹

Psychologist E.A. Esper sounds a similar warning against metaphors, since we can easily “...barter understanding for mere *voodoo formulas*.” (e.a.)³² And it is not a rare event:

We have had to learn that our ordinary language habits are not reliable guides to scientific analysis. The use of various traditional senses of such words as matter, force, space etc., cause great *confusion* in physics and biology, as did words such as soul, mind, consciousness, will, ego etc., in psychology. (e.a.)³³

The tragedy of Western science is its tendency to “promote adjectives to the rank of substantives,” to make functors out of functions. By this confusion between functor and function we “barter understanding for voodoo formulas.” It all goes back 2500 years to Greek metaphysics. Modern scientists have so far refused to update their philosophy in keeping with their rapidly expanding body of information. Animism still reigns.

Herman Dooyeweerd published a penetrating critique of this Greek legacy, so fatal to our understanding of the real world, in a series of articles in *Philosophia Reformata* between 1943 and 1946.³⁴ He pointed out that Aristotle used to abstract a function such as life from a functor and then endow it with a substance called anima or soul.

Aristotle ascribed an “anima vegetativa” to plants, an “anima sensitiva” or “animalis” to animals and an “anima rationalis” to man. He even speculated that the fertilized human ovum first got a plant-soul, to be replaced with an animal soul and before birth the latter was destroyed by the final product: the anima rationalis. Only then does the fetus become a human being. (It is interesting to note in passing that abortionists still base their

claim that a fetus is not a “human person” on this old notion of Aristotle, not on any new scientific discovery.)

Dooyeweerd showed that this habit of assigning an invisible “substance” to all these functors was taken over by Thomas Aquinas. Through Thomas this animistic habit is still prevalent among many Western thinkers, as Dooyeweerd demonstrated from their philosophies. This animism has inhibited man’s understanding for centuries.

If we will learn from Dooyeweerd’s enquiries into the nature of scientific thought, we can greatly benefit in our biological investigations. We will then constantly be on our guard against assigning the status of substantive to adjectives or functor status to functions. Then we can describe things and processes as they really are, not as some obsolete and preconceived notion persuades us they must be.

If we cleanse our words of irrational meaning, we can avoid confusion between scientific language and metaphysical metaphors. And then our words will carry the meaning for which they were formed: to convey states of affairs as they exist in the real world. We will then know the difference between human reason that assigns spirits to matter, and reason inspired by the soaring spirit of the Lord of Creation, Whose works we see.

NOTES

20. Renee Descartes, *Meditations*, 1.
21. Renee Descartes, *Disc. on Method* Part 4.
22. *ibid.*
23. *ibid.*, Part 2.
24. *ibid.*, Part 6.
25. Herman Dooyeweerd, *A New Critique of Theoretical Thought*, (Amsterdam: H.J. Paris and Philadelphia: The Presbyterian and Reformed Publishing Co., 1953-1957), vol. 1, p. 204 (Hereafter cited as *N.C.*).
26. F. Engels, *Dialectics*, p. xv.
27. *ibid.*, p. 26.
28. A.I. Oparin and K.L. Gladilin, "Evolution of self-assembly of probionts," *Biosystems*, vol. 12, nos. 3 and 4, (1980), p. 133ff.
29. Thomas S. Kuhn, *The Essential Tension* (Chicago: Chicago University Press, 1977).
30. Jacques Monod, *Chance and Necessity*, trans. Austryn Wainhouse, (New York: Vintage Books, Random House, 1972) p. 81 (Hereafter cited as *Chance*).
31. Paul A. Weiss, "The Living System" in *Beyond Reductionism, The Alpbach Symposium, 1968*, ed. Arthur Koestler and J.R. Smythies, (London: Hutchison, 1969) p. 35 (Hereafter cited as *Beyond*).
32. E.A. Esper, *A History of Psychology*, (Philadelphia: Saunders, 1964) p. 15.
33. *ibid.*, p. 60.
34. Herman Dooyeweerd, "De Idee der Individualiteits Structuur en het Thomistisch Substantiebegrip." (The Idea of Individuality Structure and the Thomistic Substance Concept), in *Philosophia Reformata* (Kampen: J.H. Kok, 1943-1946), vols. 8,9,10,11.

In the Beginning God Said:...

a. The problem of Augustine: creation and spontaneous generation

Anyone who calls himself a Christian must believe the word of God. That means he takes the book of Genesis seriously and accepts in faith that God has created the heavens and the earth and all the host of them – Gen. 2:1.

God created all living beings. Throughout the course of history, Christians have tried to deepen their understanding of God's creation with the help of scientific enquiry. But they often found it difficult to dovetail Christian exegesis of the Bible with some scientific theories.

There have been many confrontations between science and the Christian confession. What do you do when a theory seems to clash with faith? Which do you choose? There are two ways we can err. Our exegesis may be wrong. But our theory can also become obsolete and be refuted. How to avoid errors?

Obviously errors of both kinds can cause a great deal of embarrassment for serious Christians. The scientific community is not as vulnerable as the church. When a theory is found wanting, it is just replaced by a better one. That is not seen as a failure of science but rather as a sign of its maturity.

Matters are worse for the church. What happens when Christians tie an important doctrine of faith to theories invented by scientists, philosophers or theologians that turn out to be false?

In matters of faith we hold certain statements about biblical exegesis to be absolutely true. When scientists subsequently can clearly show that such a statement is based on a glaring scientific error, the unbelievers will be the first to point it out to one and all. And they will not only ridicule the Christian who erred. They always point to the superstitious nature of religious people. The problem then is how to avoid tying church doctrine to speculative propositions that are likely to be refuted.

Augustine provides a classical example of this type of problem. He liked the theory of spontaneous generation. It had been taught for centuries. But

how to rhyme it with the story of Genesis? He came up with a scheme, typical for this age, and derived from Greek philosophical speculation.

For what follows I quote from an article written by Dr. H. Diemer which appeared in *Philosophia Reformata* under the title: “Natuur en Wonder” (Nature and Miracle). The translation is mine.

Before the creation of heaven and earth, says Augustine, the unalterable relations of things were comprised in God’s word. Things were created in the beginning corresponding with divine ideas. For that reason the things which God had designed could be determined in their relations as germs and causes in the course of time. These things were therefore all present from the time of creation, but they were not yet created in their actual and complete individuality. They lay enclosed in potential in their rational causes (“causaliter et rationalibilter”) before they issued forth in time.³⁵

In this clever arrangement all things had been created in the beginning as a “possibility” (in potential). However, they were not ready yet for our inspection until God in His providence decided it was time to display them.

No doubt this theory was inspired by Aristotle’s theory of spontaneous generation. Scientists of his time did not yet know how some organisms arose since no eggs were found. So they “explained” this by assuming that they appeared spontaneously. That was a theory they could not test at the time and was thus quite speculative.

Augustine tried to explain the story of Genesis. He saw the continuing generation of new organisms as a phenomenon that conformed to the spontaneous generation theory of Aristotle. But it seemed to clash with the biblical information that God created all living things “in the beginning.” How then can new organisms appear “spontaneously?”

By his ingenious invention of “rational causes,” Augustine thought he could still make God come out with the honor of having created them. Of course, rational causes were no more accessible to testing for Augustine than spontaneous generation was for Aristotle.

When the Aristotelian speculation was refuted, Augustine’s attempt to explain Genesis was shown to be both false and unbiblical. It was false because all living things were shown to arise from their predecessors via asexual division or through eggs or spores. This falsity could have been expected if Augustine had realized the speculative nature of his theory. It was also unbiblical because it had no basis in the story of Genesis.

We will find these attempts to prove the truth of the Bible with the use of a scientific theory throughout history. Many well-meaning Christians are still doing just that today. Man has even tried to prove through “scientific” reasoning that God exists. That shows that we must always be on guard, especially against theories that cannot be tested, against speculation.

History has amply shown that God does not need our attempts to prove that what He says is true. And when our fallible scientific theories are overthrown, we are seen to be unscientific and gullible. But what is worse, the unbeliever tends to mock the Lord because of the foolish presumption of His children. Man must not try to put what he has invented in the place of “In the beginning God said...”

b. The modern accommodation: theistic abiogenesis

We see the same effort of Christians in our day. Many try to “explain” the teachings of Genesis about origins with the help of modern scientific theories.

In *Eternity* of May, 1982, D. Young listed six major such attempts at explaining creation. Each of them is accepted by some group of bible-believing Christians today. Each has a different “theory” on how to rhyme the exegesis of Genesis I with existing scientific theories.

Briefly they are:

1. The six days of creation really were long periods of time.
2. The six days were literal days, separated by long periods.
3. God created the cosmos perfectly and it lasted for a long period. However, it came to ruin, “formless and empty.” God then rebuilt it in six ordinary days.
4. The framework theory sees the days merely as literary devices.
5. The pictorial theory suggests that the creation story was told in six days.
6. The literal-historical theory states that creation occurred in 144 hours.

These differing views have caused a great deal of discord among Christians. The big question is whether this could be avoided.

God’s record of His creation in six days is so simple that a child can understand it. It is also as much beyond our scientific analysis as God Himself and as all the miracles we read about in the Bible.

When we begin to examine how living beings function, we will continuously be confronted with solid barriers to human understanding. Only those stricken with blindness can fail to see the miraculous way in which even the humblest bacteria do their thing. But, as Jesus said, unless we become like children, we will have trouble entering the kingdom of heaven.

We can be brief on the six theories. None can be tested. They are all speculative. They are all invented for the purpose of fitting the story of creation into a theory held by a group of scientists, philosophers or theologians.

All proponents are creationists. All deal with the issue of the six days of creation, often in order to fit in the doctrine of evolution. But the vast dif-

ferences between these speculative theories should warn us that most of them are likely to be refuted.

Evolution deals with the development of the species. That is a vast subject which we do not wish to deal with here. It deserves a special volume. This work is deliberately limited to the origin of life. We wish to examine the theory of abiogenesis. We wish to see whether it is a valid theory.

Several leading Christians have adopted it and use it as a foundation for their view of the world. On this basis they erected the structure of the theory of evolution.

If abiogenesis can be shown to be false, the whole issue of evolution will need to be re-examined. That could lead to interesting conclusions. It could also lead to a coming together of many Christians on a central point of controversy in their confession of God's truth. And perhaps that might encourage them to join forces in the battle against unbelief in unison.

One example from recent church history may demonstrate the problems we get into if we let ourselves be drawn into the metaphysical speculations of believers and unbelievers alike.

Dr. A. Kuyper, a well known theologian in the Netherlands over one hundred years ago, addressed himself to the problem of evolution with vigour. His influence was so great that to this very day people in reformed circles quote him, even in America. In 1899 he asked in a public lecture whether Christians can accept the theory of evolution and his answer was:

...against *that system* of a cosmos built mechanically, without purpose, we should register our opposition in every area.³⁶

In his book *Creation and Evolution* J. Lever discussed Kuyper's own view on the "spontaneous evolvment of the species from one primary cell." Surprisingly, Kuyper's answer was a firm "yes":

...without reservation. We should not impose our style upon the Chief Architect of the universe...Evolutionistic creation presupposes a God Who has first made the plan and then executes it omnipotently.³⁷

For a Christian, the question here is not whether God is capable of putting living things on earth through "evolutionistic creation." The question is whether God *did* indeed order the "spontaneous evolvment of the species from one organic cell." Kuyper simply did not ask the right question.

Let us now look at how Kuyper as a theologian saw abiogenesis. According to Lever, Kuyper had no problems with this question:

...it is clear that Kuyper viewed as compatible with the Christian confession a general evolution *from lifeless matter to man* which was guided by God and began with *one* creation at the beginning.³⁸

If Lever's report is correct, Kuyper speculated that God *did* create the universe with a built-in "program" of abiogenesis. He said: "Gentlemen, since God can do anything and scientists proclaim that things evolved "spontaneously," I will proclaim that God indeed did it that way. But you must promise to accept that God thought of it first." And that was exactly the position Augustine took with respect to spontaneous generation.

Now let us see what the Christian biologist has to say about theories adopted by the various Christian groups to "explain" Genesis. And that also involves abiogenesis. He states:

...none of the former classic views in Christian circles today can stand the test of criticism. Fundamentalism as well as supranaturalism appear to have originated from a partly philosophical accommodation to untenable speculative scientific hypotheses and pseudo-certainties.³⁹

Now, he says, we must change our attitude:

...we as Christians must be in earnest about the problems before which natural science places man today, but further, (we must make sure) that our faith does not hamper our science and even less that our faith has to be engaged in an irreconcilable conflict with the data we have at our disposal.⁴⁰

So now we have to decide whether we have data at our disposal that support the theory of abiogenesis. We must check whether he manages to avoid "untenable speculations." We must also examine the alternative approach Lever recommends and the data he produces in support of theistic abiogenesis.

c. "*Christian*" speculation

Lever begins by saying that it is impossible to point out:

"...where and when life appeared for the first time, how this process came about and what originated in that way...⁴¹

That is a sound scientific position. He then presents us with his own "scientific" choice between the theories available:

...the essence of the entity of life...was created "in the beginning." It is being realized constantly under God's guidance along a line of...natural processes, since this entity of life was present in creation as a possibility...⁴²

First of all, we recognize that he treats "life" as a functor here. We know that doing this to an abstract concept amounts to abstract animism. He also forgets his own statement that it is impossible to point out "how this process came about."

Then suddenly he adopts the teachings of the proponents of abiogenesis, only with God as supervisor:

Then God caused to exist such a state of affairs of moisture, pressure, temperature and the like that all conditions for the realization of life as He wished it had been fulfilled.⁴³

And finally:

Through these processes, step by step, and very purposefully, the atoms and molecules were arranged and combined so that there originated a very definitely constructed protoplasm in which the created entity of life became manifested.⁴⁴

We will see later on that this is the same scenario materialists have given for the origin of life.

Dooyeweerd gave an extensive review of the book by Lever, one of his favorite pupils. In response to the above quote, Dooyeweerd comments:

To my regret I can no longer follow my friend Lever here.⁴⁵

Dooyeweerd rejects this “emergence” theory of life as self-contradictory. In addition, Dooyeweerd argues – and in agreement with what Lever wrote as quoted at the start of this section – that from a scientific point of view we know *nothing* about the origin of the first living beings on earth because we *cannot* know:

Every evolutionistic hypothesis which tries to explain this origin along physico-chemical lines transgresses the boundaries of natural science...We must avoid any concession to such an evolutionistic hypothesis.⁴⁶

Dooyeweerd denies that Lever has the data he needs in support of his theory:

I cannot see in what way these questions can be brought to a really *scientific* solution. And I know of no *facts* which can more or less force the hypothesis in question upon us scientifically...⁴⁷(e.a.)

I.e., the hypothesis is not a scientific one. Worse still, his objection to this hypothesis is that he (Lever) fails to give us:

...any indication as to in what way he thinks he can use it in science...⁴⁸

In other words, the whole theory is *useless* in science. Dooyeweerd refused to indulge in this type of speculation, so common among Christians. He knew the dangers involved. He clearly saw that Lever exposed himself to the same risk which Augustine had taken. And he feared that Lever would suffer the same fate.

Henry Morris once pointed out the well-meant but injudicious reasoning behind such efforts while discussing evolution. When Christian scientists claim that God planned and executed something in the cosmos which according to unbelieving scientists happened without “supernatural intervention,” this is:

...merely a circuitous way of saying: ‘the fact of evolution should be accepted’ in the hope that the scientists will allow the belief that God is the one controlling the process.⁴⁹

The same thing, says Dooyeweerd, applies to the theory of abiogenesis. And he advises Lever: “don’t do it.”

Belief in God’s word gives the Christian information about what He did, i.e. create the cosmos. The created cosmos can yield information to scientists about that which God created by investigation, not speculation. That is a task of sufficient size for any scientist who wishes to honor his Maker. Let us make theories about what God created and not about *how* He did it. Let us avoid Christian speculation.

d. Creationism

Henry Morris defines his view on creation as follows. It:

...postulates a period of special creation in the beginning, during which all the basic laws and categories of nature, including the major kinds of plants, animals, as well as man, were brought into existence by special creative and integrative processes which are no longer in operation.⁵⁰

For the topic of this essay that means that God created the first living being. It did not arise through the operation of mere physico-chemical laws. The only part of this definition which is not given in Genesis is the meaning of the word “period” and whether God created “laws and categories” separate from the functors that display them.

Dr. Morris rightly remarks that neither evolution, including abiogenesis, nor creation is a scientific hypothesis; “neither can be tested.”⁵¹ Neither can be scientifically confirmed or falsified. We believe one or the other on purely religious grounds.

Lever, Kuyper and all Christians who believe that God created the cosmos and living things begin with the same confession. Lever writes:

...Scripture does not impart to us scientific data...⁵²

We receive words which we must believe:

“These actualities are thus *revealed* to us in Genesis...”⁵³

And further:

“ ‘creatio’ in the absolute sense stands over against ‘evolutio’ in the absolute sense.”⁵⁴

He is right in saying that a creationist need not be afraid to examine all scientific data. That includes all evidence he can produce about the origin of the first living thing on earth. If anyone can provide something that has a bearing on this, he can look at it. Why should he worry that God might say one thing to us in His word and then contradict Himself when He speaks the word that gives rise to living things? Humanists certainly don't worry about that. So why should Christians do this? But as we have seen before, we must avoid useless speculation at all cost.

Obviously, the next thing we must do now is to examine the *data* provided by science. And then we will hear the arguments in support of the *theory* of abiogenesis. It is a founding doctrine for the religion of humanism. It substitutes the word of man for the word God spoke and which brought forth this creation. We must decide whether it has any scientific merit or whether it clashes with reality as we find it in creation. And if it does, it is likely to clash with the words: “In the beginning God said....”

NOTES

35. Harry Diemer, "Natuur en Wonder" (Nature and Miracle) *Phil. Reform.* vol. 8, p. 121.
36. Abraham Kuyper, "Evolutie" (Evolution), Rectoral Oration, Free Univ., (Amsterdam, 1899) p. 7, quoted by Jan Lever, *Creation and Evolution* (Grand Rapids: Internat. Public., 1958), p. 228. (Hereafter cited as *Creation*).
37. *ibid.*, p. 229.
38. *ibid.*, p. 231.
39. *ibid.*, p. 131.
40. *ibid.*, p. 132.
41. *ibid.*, p. 57.
42. *ibid.*, p. 57.
43. *ibid.*, p. 58.
44. *ibid.*, p. 58.
45. H. Dooyeweerd, *Phil. Reform.*, vol. 24, p. 125.
46. *ibid.*, p. 129.
47. *ibid.*, p. 156.
48. *ibid.*, p. 157.
49. Henry Morris, *Scientific Creationism*, (San Diego: Creation Life Publish., 1974) p. 216.
50. *ibid.*, p. 12.
51. *ibid.*, p. 9
52. J. Lever, *Creation*, p. 56.
53. *ibid.*, p. 57.
54. *ibid.*, p. 57.

Some Facts Of Life

Part Two



In the Land of the Minuscule

a. The little captives of the cell

Our body contains some 100 trillion cells (100,000,000,000,000), divided over about 1 billion different kinds. Some nerve cells run from the spinal cord to our toes and are over three feet long. The smallest are less than a thousandth of an inch in diameter.

The cells of plants and animals contain varying amounts of similar material: nucleic acid, proteins, fat, starches, sugars, water and salts. Each cell envelops millions of such molecules, many of which in their turn are composed of hundreds of thousands of atoms or more.

Each cell is kept together by a thin bag, the membrane, and contains small structures such as the nucleus (usually in its own bag) and other “organelles,” organ-like functional units.

Some, like our nerve cells, live as long as we do. If one dies through injury, it is never replaced and we will just have to do without it. Some bacteria, several of which cause infectious diseases, usually occur singly and can divide into two cells every twenty minutes.

In its *nucleus* every cell has its very own DNA (deoxyribonucleic acid) molecules. These serve a twofold purpose: first, to help the cell to duplicate itself into two new cells of exactly the same appearance and function. And second, the cell uses them to make all the molecules such as enzymes which it needs to keep its little busy body functioning.

These DNA molecules consist of two long strands which run parallel and have connecting rungs like a ladder. See fig. 1 on page 46. The ladder is then twisted along its long axis into a spiral. See fig. 2 on page 46. And, to make things really complicated, the whole thing then twists and folds upon itself. In that way it takes up little space in spite of its great length: in every human cell each of these spiral “ladders,” when stretched out, adds up to 6 feet in length. And if we could put all these strands of one human body end to end,

they would reach 100 billion miles, which outdistances the diameter of our solar system.⁵⁵

The nucleus functions like the nerve center for all that goes on in the cell. It contains most of the DNA, which plays a role in the hereditary characteristics of the cell. DNA also helps it to respond to changes in the environment around it.

Along the DNA "strands" are incorporated the *genes*, parts of DNA, that are specific for each species of living being. Through them the cell controls its functions, e.g. reproduction and growth. It does this through the manufacture of enzymes and other molecules it needs for its continuing health.

Every cell has many enzymes, proteins which speed up chemical reactions. Each enzyme accelerates only one reaction. When a specific molecule comes in contact with its enzyme, it is changed into a new molecule whose structure is determined by the enzyme. But in this process the enzyme itself does not change in structure.

Chemists can now isolate such enzymes and put them to work in a test tube. They just add the type of molecules which these enzymes normally transform in the cell into a specific new compound. And lo and behold, the enzyme gets busy right away in the tube and transforms all the substrate molecules it can come into contact with, just as it does in the cell. It produces the new chemical in the same way, given the right "substrate," and given the right conditions of temperature etc.

This shows that large molecules like enzymes are no different from other molecules: they all follow their chemical laws like any other chemical compound. And they do this, regardless of whether they reside in a cell or in a test tube.

CO₂ gas combines with water, H₂O, to form H₂CO₃ until the supply of either of the two substrates runs out. In the same way two substrate molecules like amino acids will combine and, with other such compounds, form proteins. These reactions are speeded up greatly with the help of the appropriate enzymes but the process is the same as with all other chemical reactions. And it too will continue until the supply of substrates runs out.

We can not fail to see a difference here however. What we just described is how molecules combine in a test tube, with or without enzymes. How does this compare with the reactions that occur in a living cell?

The cell is the *functor* which regulates its own internal *functions*. And now we see that its chemical constituents do *not* function like they would as independent chemicals outside in a test tube.

In the tube reactions go on until all available substrate molecules are used up. And all enzymes will speed up the reaction between its substrates as they come in contact with them *in a random fashion*. In the cell they do not act at

random as they would outside of their normal environment. Instead, they follow the strict directions of the cell.

Once atoms and molecules have entered the cell, they are *captives*. They now function in an *orderly relationship* with all other constituents of the cell. They are still molecules. They still only interact according to the rules set for their kind. But the cell actively *restricts the number* of chemical reactions of which they are capable. It only *allows* those which the cell needs at a time and place determined by the cell itself.

And so we see that physical particles become functional elements of the *living whole which we call a cell*. But we still don't know how the cell does all these little tricks. Let us have a look at the organs in which it manipulates all its little captives.

b. Anatomy of the Living

1. Nucleus.

We have already discussed some of the features of the nucleus, the “nerve center” of the cell. As we saw, it contains DNA required for reproduction, heredity, and protein production etc. Through its genes in the DNA the cell directs the synthesis of thousands of enzymes and other proteins. The genes are linked into *chromosomes*, which are strands of the DNA molecules. One gene may be a section of up to 2000 steps long on the DNA ladder. We will return to the nucleus for a closer look. We must now examine some of the other little “organs” in the cell.

2. Ribosomes.

When the cell needs a protein molecule, it makes a copy of the gene on one side of the DNA ladder corresponding to that protein. The copy is called RNA: ribonucleic acid. This “messenger” RNA is then transported across the nuclear membrane to the *ribosome*, a small organ where protein molecules are made. Each ribosome is less than one millionth of an inch long and one cell may have millions of them.

Inside, ribosomes link amino acids into a chain alongside a RNA molecule so that it becomes like a replica. Then the chain begins to twist and coil until it is so often less than 2000 its original size in diameter. See fig. 4. When it has assumed its three-dimensional shape, it is released from the ribosome. It takes about two minutes for making such a protein in the bacterium E.coli.

3. Endoplasmic Reticulum.

The material outside the nucleus is called the cytoplasm of the cell. It is divided into compartments by membranes which carry the ribosomes like dots on their surface. Parts of the membranes make proteins while others also make fats and other material. This is then either stored or used as required.

4. The Golgi apparatus.

This consists of a collection of membranous sacs in which large numbers of protein molecules are stored. Especially powerful enzymes need to be tightly wrapped up because, when let loose, they would destroy everything in sight through their *catalytic* function. They would just break up many molecules into fragments.

Sometimes sacs with proteins are transported to the outer cell membrane, where their contents are released to the outside. In this way hormones are secreted into the bloodstream.

5. Lysosomes.

These are sacs filled with enzymes which the cell uses for two main purposes. Some absorb large foreign molecules from food outside and with their enzymes break them down into smaller molecules. From these the cell then builds its own large molecules again. Others engulf harmful particles such as bacteria which entered the cell and with their enzymes destroy them. In both cases they function at the direction of the cell and serve its well-being. They also destroy the cell's own molecules when needed as in starvation: they break down some, e.g. fat molecules. In this way their released particles can be rebuilt into more critically needed constituents. They also kill cells where needed, as for instance in the metamorphosis of insects.

6. Mitochondria.

When an animal has eaten carbohydrate such as starch, it breaks it down into carbon dioxide and water. This releases energy which the cell stores by forming a new type of molecules (adenosine triphosphate or ATP). This happens in these mitochondria. They are small energy converting organs, sometimes more than a thousand of them in one cell. They provide 95% of the energy our cell needs for the manufacture of all its constituents.

7. Microtubules.

These are fine protein cylinders which form a network, a "skeleton" inside the cell, for supporting its shape.

8. Microfilaments.

Fine strands of protein that have something to do with the movement of cells by contraction and extension of some of its constituents.

9. Membranes.

There are membranes all through the cell and its organelles. Through them all molecules, from water to the largest proteins, must pass. A cell controls all this movement by active selection on the surface of these membranes. Some molecules are let through "against the stream," so that their concentration on one side of the membrane becomes much higher than that on the other side. They are themselves also continually changed chemically, which makes it all even more astonishing. They consist of two layers of fatty molecules, interspersed with proteins and are quite tough.

Today physicians know that *a malfunction in any of these organelles results in a disease of the cell, and in larger organisms, of the entire living being.*

A prime example of this is seen after a structural change in the DNA molecule. The cell begins to show a malfunction in its reproductive processes. And because of the central role of DNA, the new cells receive a DNA that is as defective as that of the parent cell with its attendant malfunction.

We now have an idea of the organs in which the cell does all its work. We know something of its anatomy. But we are still no closer to understanding *how* it can do it – its physiology. Before we examine that, however, we will first have a look at the methods our scientists use in their investigations.

c. Strong eyes kill fragile things

Let us now take a look at the techniques our scientists use for discovering all the weird and wonderful happenings in the living cell. And it will appear that some of the problems they run into when they try to understand the phenomena of life are of their making, albeit inevitable.

As philosophers we are in the fortunate position of the television camera operator in the concert hall when watching scientists at work. We can zero in on the conductor while the maestro can only see his orchestra.

Before the biochemist can work with the minute particles in the cell, he must first isolate them. And if he wants to analyze some of their structural features, he must first *make them visible*. How does he do this?

First, he breaks up the cell in a pestle and puts the contents in a test tube with a solvent. He then swirls this mixture around in a centrifuge at high speed and the various compounds settle in layers with the heaviest at the bottom and the lighter ones on top. To separate the compounds into smaller and smaller particles, our chemist must run his centrifuge faster and faster. This reaches its limit of centrifugal force today at somewhere near 100,000 times the force of gravity.

The next step is to look at the particles he has separated. For that he uses a microscope. With the light microscope he can see things down to a size of $27/100,000$ th of a millimeter (one millimeter is one twenty fifth of an inch). But the centrifuge has broken up his particles to a size of about one angstrom. So if he wants to see them, he needs to magnify them 1,000,000 times. Luckily, the physicists developed the electron microscope that can visualize objects of 2 to 3 angstrom. So now large molecules in the cell can be “seen” and photographs made of them.

There is an important feature to all this work: electron microscopes operate with a vacuum. That means that we can never see anything alive

through it. All things observed through this instrument *are dead*. Now that is no problem for a chemist. He never works with living things anyway.

There is another fact we must bear in mind here. There is near-general agreement among scientists today that molecules have only physico-chemical functions. All molecules are dead, whether they were once part of a living thing or not. They are *inanimate matter*, regardless of their sometimes incredibly complicated structure. So our chemist has no problems experimenting with them in his laboratory.

We are in search of an answer to the question: "What is it that makes all these dead molecules behave like good little soldiers in a well trained army?" *We will try and refrain from speculation*. We can only expect to get a scientific answer if we adhere to the method that has borne such abundant fruit in the past: the scientific method.

In the next chapter we will examine some of the processes observed to bring order into what takes place in the cell. Only after that will we be in a position to listen to the answers the most eminent scientists have given to our question. After that we must make up our own mind about what they have to say. And through all this we will remember that "strong eyes kill fragile things."

NOTES

55. Maya Pines, *Inside the Cell*, (U.S. Dept. of H.E.W., Publ. no. <NIH> 79-1051, 1979) p. 29.

The Little Demons of Jacques Monod

a. Proteins are beautiful

Now that we have had a look at the general anatomy of a cell, we will zero in on the molecules inside again and trace some of their adventures. We want to know some of the things the cell does to *stay alive*. There are untold millions of *different* protein molecules on earth. Alongside of the plants, there may be 10,000,000 species of animals on our planet.⁵⁶ And in addition to that, each individual member of the human race has his own specific proteins. That is why one member rejects the transplanted tissues of another, except for identical twins.

Proteins are made up of strings of 20 different amino acids. This is true for all living beings, from bacteria to man. There may be up to 10,000 amino acids in one protein molecule, but only made up in combinations of the same 20. We can imagine such a protein as a string with 10,000 beads of 20 different colors. And the number as well as the sequence of these combinations of the twenty amino acids in the string determines the chemical characteristics of the protein molecule.

We noted before that, once formed, the chain twists and folds upon itself, just like the DNA does, and so takes up less space. The end result of this process is usually a roundish structure: a globular protein molecule.

The bacterium *E. coli*, which we all carry in our lower bowel in untold numbers, has some 500-2500 *different* proteins. Our own body cells can have over 1,000,000 *different* proteins.⁵⁷

Enzymes are catalytic proteins as we noted before. They can speed up a chemical reaction by as much as 100,000 times.⁵⁸ The change of one type of molecule into a specific new one needs a specific enzyme. To change two different molecules into the same end product takes two different enzymes. Each of them speeds up (catalyses) only one reaction. Enzymes are very fussy indeed. Their functional laws are very individually determined by the Creator of proteins.

Chemical compounds can form two different types of bond:

i. *Covalent bond* which is the ordinary chemical bond. It involves quite a bit of energy exchange. These bonds are relatively *stable*.

ii. *Non-covalent bond*. This needs very little energy exchange and is *unstable*. Some stability is acquired if the two molecules are very close together and “fit” into each other with their atomic arrangements.⁵⁹

Enzymes form a non-covalent bond with the molecule they are to help change – their substrate. That means that the enzyme must “fit” into the structure of its substrate. Seen in three dimensions, it must be *stereospecific*. Because the bond is of the non-covalent type, the complex of enzyme + substrate can come apart quickly. That is important if the enzyme is to convert many substrate molecules in a short span of time without changing its own structure.

The stereo-specific nature of the enzyme results in the “exclusive choice:” only one form of substrate fits into it. This resembles a three-dimensional jigsaw puzzle. And the substrate must be presented in exactly the right position to the enzyme in order to make the “fit.” This stereospecificity also applies to other chemical reactions in living things and involves other molecules than enzymes as well.

Because of their fit for a specific “partner” or substrate, enzymes enable the organism to establish and maintain order in what would otherwise be chaos, chemically speaking, among its millions of inhabitants.

It takes a living cell over 75 special kinds of protein and RNA molecules to make *one* protein following DNA “instructions.” Each living being has untold numbers of protein molecules like this at its disposal. They are like delicate tools for making complicated structures in an incredibly accurate fashion. This makes us ask: “Aren’t proteins beautiful?”⁶⁰

b. Regulating chemical traffic

A special class of enzymes is called *allosteric*.⁶¹ Like all other enzymes, they catalyze reactions. But their activity is regulated by other chemical compounds. When such a compound comes close enough, the allosteric enzyme forms a simultaneous bond with it as well as with its substrate. And now the plot thickens.

Depending on the nature of this newcomer, this second bond will accelerate or slow down the catalytic activity of the enzyme upon its substrate. This new arrival will push the gas pedal or the brake, as the case may be. But each can only act in one way. It is either a “speeder-upper” or a “slower-downer.”

There are at least five different ways in which molecules can regulate the speed of enzyme function. In this manner a type of “feedback system” ensues which the cell needs for an orderly function of its chemistry.⁶²

Monod compares an allosteric enzyme with an electrical relay switch, controlled by several electric potentials at the same time. But such a “relay” weighs only some $1/10^{17}$ of a gram. Each cell has hundreds of thousands of these little chemical “relays,” through which it regulates the incredible complexity of its metabolism.

Enzymes act on substrate molecules from small to very large, including enzymes themselves. For they too must be put together by catalytic enzymes. Monod described the synthesis of one system of three proteins in bacterium *E. coli*. This lone event is of an “almost miraculous”⁶³ complexity. Yet many thousands of similar reactions take place in our lowly little bug, of which we harbour so many billions.

We now know that enzymes act under the control of “regulatory” compounds. But what animates these regulators?

c. Who regulates the regulators – clever little devils?

In the previous section we discovered how enzyme activity is directed with the help of other molecules. So now we must go on to the next step and ask what regulates the function of the regulators. Monod thinks he knows the answer. These regulators are free agents and do what they decide must be done. They are:

...responsive to physiological requirements...these performances appear freely chosen and organized by regulatory proteins.⁶⁴

The allosteric enzyme, says Monod, is the product of molecular “engineering.” Protein molecules produce allosteric enzymes. And allosteric enzymes regulate the production of these proteins. Thus proteins (enzyme type) produce proteins (allosteric type), which produce proteins (enzyme type). Does he see a problem of circularity here in his theorizing? At first sight, he seems to be puzzled. These processes seem to:

“...transcend the laws of chemistry...”⁶⁵

Indeed they seem to do so.

But wait, he has an answer. The system (= the organism) creates a huge “cybernetic network” (i.e. a system) which enables the organism (again a system) to perform its functions. So a system creates a system to make itself, the original system, work. Did anyone ask about circular reasoning again? We will return to this problem of systems later.

We can, says Monod, interpret all these performances at the molecular level:

...it is in the structure of these molecules that we must see the ultimate source of the autonomy, or more precisely, the self-determination that characterizes living beings in their behaviour.⁶⁶

But he fails to reveal what “system” it is that creates the network and how it relates to the organism it serves. Instead, he quickly goes back to his molecules.

The regulatory proteins freely *choose* and *organize* and so avoid what would otherwise become random chaos. For this worthy purpose Monod endows inanimate molecules with the power to act like humans. Proteins “recognize” other molecules that fit the requirements of the organism. With the help of their “cognitive ability,” “they animate and build living systems.”⁶⁷

All this presents quite a challenge to molecules, only qualified for physical activities. So now they must tackle the job of logical thinking and distinguishing. And then they have to go to work and build. Let us see how Monod goes about training his little “demons,” as he calls them.

He kindly helps us to understand this better as follows. He tells us some more about how the strands of amino acids start to twist when they form proteins. These acids link up through stable co-valent bonds. But in addition they attract each other sideways via “projections” in various places and so form non-covalent bonds as well. This causes the strands to twist, turn and fold upon themselves through mutual attraction.

At first sight, this seems to make no sense. Why should the whole thing turn into a convoluted maze? The answer: this specific sequence of amino acids in the strand allows for *only one* way in which the protein molecule can end up in its three-dimensional shape.

A hydrogen atom is governed by laws that differ from those that rule oxygen atoms. And the laws that make their combination H₂O molecules act like water are different again. In the same way each protein molecule must follow the physico-chemical laws set for all the likes of its little individual self.

Each particular (=idios) material particle is governed by its own law (=nomos) or set of laws. Something that sets its *own* laws is *autonomic*. Something that has its law set for it from *outside* is *idionomic*. We hope to demonstrate in what follows that this is a very useful term for our enquiry and can eliminate a lot of confusion. So now we see that our new protein molecule must assume a shape, set for all molecules made of the same sequence of amino acids. It just follows its idionomy.

Monod does not know the word idionomy. Yet he too knows that each type of protein molecule reacts in the way it does because it *must* obey existing chemical laws. That is why he writes that the peculiar sequence of its amino acids “dictates”⁶⁸ how it shall react with other molecules. This sequence imposes:

...an unequivocal interpretation of a potentially equivocal *message*.⁶⁹ (e.a.)

Here he introduces a new concept. He has abstracted the amino acid *sequence* from the protein and gives it a mysterious quality, not usually associated with inanimate molecules: the sequence becomes a message. But that is a product of a typically human activity. Thus he has accomplished the remarkable feat of introducing the two types of animism we distinguished before.

First he assigns spiritual functions to concrete physical functors when he lets molecules think. That is concrete animism. It is significant that, in the footsteps of Maxwell, he calls them his “demons,” beings well known for their spiritual properties. Next he assigns to the abstract concept of “sequence” the power to “give an unequivocal interpretation of a...message.” And that is *abstract* animism again.

Esper called this type of mythologizing: “bartering understanding for voodoo formulas.” But Monod is still quite sure of himself:

The *ultima ratio* of all...structures and performances of living beings is thus enclosed in the sequences of residues...of the globular proteins which in biology play the role Maxwell assigned to his demons...⁷⁰

At this level we must seek the secret of life. If we could only find the law which tells amino acids how to assemble themselves.

We will see later on that the discovery of this law would call forth a series of new questions that are just as baffling. Meanwhile Monod has still not revealed to us who regulates the regulators.

And so we must resign ourselves to the fact that he has produced a number of “voodoo formulas” which explain nothing. He has offered much valuable information about chemical reactions and molecular structures. But he also has left us much not-so-valuable metaphysical speculations about his clever little devils. He indulged in both concrete and abstract animism. Since he dealt with the micro-world we may call it MICRO-ANIMISM.

We will have to look elsewhere for help in our search for the regulators, those clever little devils.

NOTES

56. Ernst Mayr, *Evolution and the Diversity of Life*, (Cambridge, Mass., London, Eng.: The Belknap Press and Harvard University Press, 1976) p. 519.
57. J. Monod, *Chance*, p. 48.
58. M. Pines, *Inside the Cell*, p. 24.
59. J. Monod, *Chance*, p. 55.
60. Gary Parker, *Creation*, (San Diego: Creation Life Publ., 1981), p. 13.
61. J. Monod, *Chance*, p. 63.
62. *ibid.*, p. 64.
63. *ibid.*, p. 74.
64. *ibid.*, p. 78.
65. *ibid.*, p. 78.
66. *ibid.*, p. 78.
67. *ibid.*, p. 81.
68. *ibid.*, p. 93.
69. *ibid.*, p. 94.
70. *ibid.*, p. 95.

Cell Duplication and the “Equivalent of Life”

...there can be little doubt that the genetic mechanism is, for all practical purposes, the equivalent of life.⁷¹

a. The unmoved mover

Proteins arise from DNA molecules in the cell through a complicated process, described by L. Dillon in his book of 1978. In what follows, I will give a simplified version of his description which contains the basic facts we need for understanding the theories on the origin of life.

Watson and Crick presented a model of the structure of DNA molecules which has been generally accepted as correct. Its official name is *deoxyribonucleic acid*. Each nucleus of living things has it and the basic structure is the same in all.

A DNA molecule:

i. Consists of two (anti-) parallel strands of molecules which have mutual non-covalent bonds at regular intervals like the rungs of a ladder. See fig. 1. p 46.

ii. Each strand is a string of molecules called nucleotides and the string is called a polynucleotide.

iii. Each nucleotide has in its half of the “rung” a nitrogenous base, (purine or pyrimidine) and there are four different types of them, abbreviated as A, G, C and T. These are called the “letters” of the genetic “alphabet.”

iv. Through these bases each two opposite nucleotides form a non-covalent bond and that completes the “rung” at every level.

v. Each opposing pair of bases can only form a bond in this combination: A-T, G-C, T-A, and C-G. The number of pairs has no limit. The 1-mm long DNA molecule of *E. coli* (over one billion of them in 1 ml of glucose solution) has about 3,000,000 of such pairs.

vi. The “ladder” is twisted around its long axis, in the case of *E. coli*, 300,000 times.⁷²

vii. In the nucleus DNA folds up and forms a complex network called chromatin. During cell division this condenses and forms rod-like bodies called chromosomes. The old idea that a chromosome consists of one DNA molecule seems to be too simplistic.⁷³

viii. Genes are segments of the DNA molecules and each gene is a sequence of enough “letters” of the genetic “alphabet” to give the “information” for the formation of a protein. The letters combine in groups of three into “words” or “triplets” and each word gives the information for one amino acid. Thus a protein molecule with 100 amino acids needs a sequence of 300 nucleotides on the DNA strand and that sequence is its gene. DNA is bound to proteins all around it and these molecules do the work of protein synthesis.

DNA is entirely inert. That guarantees its stability in all the frenetic activity going on in the cell. And that stability preserves the information for transmission to the next generations throughout time.⁷⁴

DNA is said to be the *code* which contains the information for virtually all the happenings in the cell, without DNA itself participating in these events. In that sense it is the “unmoved mover” of the cell.

I and II are two sides of the frame of the ladder, each called a polynucleotide. A, C, G and T are the four amino acids. Only A-T, T-A, G-C and C-G occur. D is the deoxyribose part and P the phosphate part of the nucleotide. (Nucleotide encircled.) During replication the non-covalent bonds are broken and the rungs of the ladder come apart.

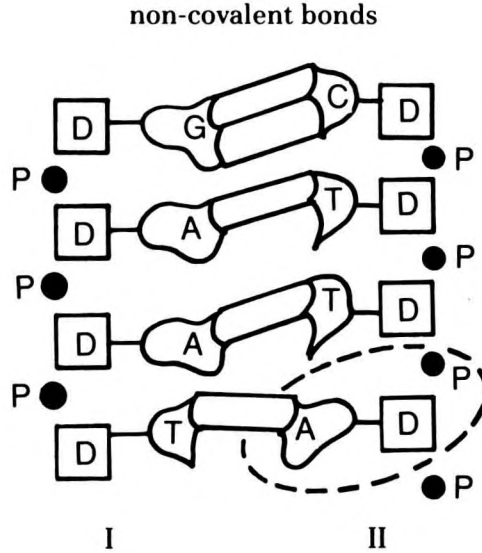
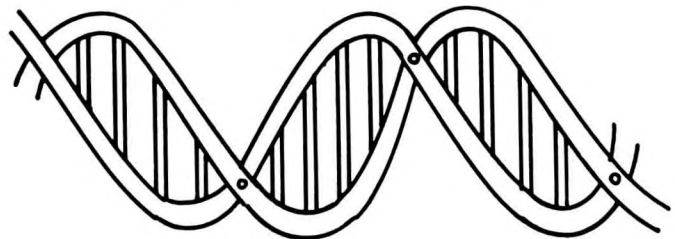


Figure 1

Figure 2:
The double helix or twisted ladder model of the DNA molecule.



b. Of scholars, travellers and laborers

The molecules around the DNA must do the work. *The DNA molecule itself is like a book. It is inert.* It contains a message which must be read and transcribed. Because there is so much information, many molecules are needed to act like scholars: they must read it and transcribe it into language that other molecules can understand and use.

In a simple HeLa cell there are about 35,000 different types of these scholars at work reading the book.⁷⁵ We call them messenger RNA or mRNA. There are many enzymes around that destroy them and others that make new ones. As a result, their half-life (the time it takes for half of them to disappear) is from a few hours to a few days.

With the help of proteins and other molecules, mRNA somehow manages to form a copy of the words in a gene on the DNA that spell out how to make a new protein. These words are, as we saw, made up of groups of three letters. And each spells out the information for making one amino acid. One such word is called a *codon*. This process is “chemically inexplicable.” Dr. Dillon therefore *assumes* that it has been made through “evolutionary processes” (e.a.). He fails to tell us why however.

Once they have read the message, the scholars themselves become the message and present themselves to transfer RNA molecules or tRNA. These are equipped with phosphorus which acts like fuel to give them energy, with crucial enzymes that bind available amino acids, magnesium, etc. All these molecules know exactly what to do and at what part of the complicated tRNA to do it.

Surrounded by all of its colorful and varied retinue of busily working molecules the tRNA, which already holds the mRNA, arrives at the ribosome. We saw in Chapter V that ribosomes are like little factories with assembly lines. They consist of protein (40%) and for the rest of ribosomal RNA or rRNA. These ribosomes enable the tRNA to read the message which mRNA copied from DNA. The ribosomes in turn can now manufacture protein molecules in a process whose details “are now barely being glimpsed.” The ribosome is a busy place of work and its laborers never slow down their labor.

And so we learn that protein molecules can assume the role of scholars, reading, understanding and communicating information from DNA molecules. They can also act as travellers bearing messages. And finally they may become assembly-line workers. What does all this mean?

c. Who makes the cars?

DNA “renders vital service” in getting the required messages across, but in the lifeless fashion of a book. As Dillon puts it, the proteins are the active

ingredients of the genetic mechanism. They take their cue from DNA and RNA in the manufacture of the cellular constituents.

Some problems have arisen here which we will try to clarify with the help of a metaphor.

1. Proteins are the endproducts of the assembly line in the ribosome: they are like the cars that roll out of a factory.

2. But the factory is manned by proteins, i.e. the very cars it makes.

3. In addition, the technicians who helped to copy the instruction manual which describes how to make cars are made by the same products, i.e. the cars. For the proteins help to duplicate the DNA.

4. And the engineers who read and interpret the manual cannot do this without the help of proteins, the same products of the factory.

5. To top it all off, the cars do the actual building of the factory and the printing of the book that tells the engineers how to make these cars. Dr. Dillon still has quite a bit of explaining to do before we can understand "the works."

d. New life springs forth from the old

When a cell gets ready to divide, DNA must be duplicated so that the two new cells will each have all information, now possessed by the original cell. This process starts with the separation of the two strands that, running parallel, make up the ladder. The rungs must be broken in their middle. When that is done, the two strands form a mirror image of each other. Now each of them must get its new mirror made to reconstruct it into a whole DNA molecule with its ladder configuration. Who does the splitting up of the two halves and the rebuilding of these into two complete ladders? Proteins.

Our lowly *E. coli* weighs about $1/10,000,000,000,000$ gm. As we noted above, its DNA has 3 million pairs of bases, the rungs of its ladder. And the ladder is twisted around itself once every ten bases, which gives it 300,000 complete turns. If this DNA were to unwind itself before it can be split in two, it would have to revolve that many times. Since it only lives twenty minutes before it divides again, it would have to revolve at least 15,000 times a minute. That is asking too much of an "inert" DNA molecule. In addition, because of the heat generated by friction, the whole thing would simply burn to a crisp. Fortunately the ubiquitous proteins come to the rescue.⁷⁷

Protein enzymes "know" when it is time to begin breaking up the rungs of the sections. Each enzyme "recognizes" the part of DNA which it is capable of splitting, and in a short time they have accomplished together what seemed impossible.

Enzymes break down the nearly endless chains of nucleotides into manageable segments. They separate the twin strands. They make way for the

reassembly of newly made nucleotides from material that somehow becomes available where and when it is needed.

Once things are ready for rebuilding the new pair, the wrecking crew makes way for the construction gang. Newly arrived enzymes connect the new sections into complete ladders, twists and all. When this is done and the cellular material outside of the nucleus is also duplicated, the double organism is split up by other enzymes and now there are two.

Through all this frenetic busy-ness, the enzymes themselves are continually broken up by enzymes which specialize in that sort of activity. And other specialists rebuild similar enzymes in order to keep their supply up with demand.

And so all these clever little demons of Monod keep doing their own thing. Putting aside all metaphors, we are justified in asking what it is that controls the work of all the chemical compounds we call proteins. We have learned a great deal from the investigations of brilliant scientists such as those on which we reported. Yet, neither Monod nor Dillon has given us more than metaphors, even when the latter claims:

LET IT BE CLEAR THAT THE GENETIC MECHANISM MUST BE VIEWED AS THE VIRTUAL EQUIVALENT OF LIFE ITSELF.⁷⁸ (e.his)

We have learned much about molecular structure and chemical reactions. But we are yet to receive a scientific account of what it is that makes chemicals “spring to life.”

NOTES

71. Lawrence S. Dillon, *The Genetic Mechanism and the Origin of Life*, (New York: Plenum Press, 1978) p.v. (Hereafter cited as *Mechanism*).

72. *ibid.*, p. 83.

73. *ibid.*, p. 100.

74. *ibid.*, p. 121.

75. *ibid.*, p. 125.

76. *ibid.*, p. 139.

77. *ibid.*, p. 204.

78. *ibid.*, p. 204.

Part Three

Animism in the Space Age



Life from the Dead

a. Striving for origin

“There is nothing so strange or so little credible that it has not been maintained by one philosopher or another.” – R. Descartes⁷⁹

In the preceding chapters we had a glimpse of how living beings *maintain* and *reproduce* themselves. What we saw thus far was complex physico-chemical reactions and interactions. We came no nearer to understanding “where they live.”

We were offered metaphors from the world of wheels and drive shafts. Dillon referred to life as being equivalent to a genetic *mechanism*. Monod saw a chemical *machine* in every living thing. We found nothing but empty words that failed to explain life.

Many scientists have tried to define life. It has become fashionable and therefore scientifically acceptable to say: “we will understand the *essence* of life when we have discovered its origin. Let us therefore try to do so.”

Every university seems to agree with this proposal. Most scientific books that deal with origins say it. For that reason we must now turn our attention to the attempts made to unravel the mystery of origins.

Let us begin with a brief look at the development of the idea. Following that we will present the theories, formulated by some of the more prominent scientists on life’s origin. Only after we have gained some insight into the “present state of the art,” will we attempt to give some constructive critique.

Our scientific equipment has become ever more sophisticated. And, all along, the search for how life *originated* has kept pace with the study of how an organism *maintains* its living state. And as the extent of our knowledge of chemical structures, metabolic processes and the physiology of living beings grew, so did the sophistication of man’s striving for his origin.

b. The French Connection

On the basis of their observations, the biologists of the seventeenth century had largely abandoned the idea of spontaneous generation. Whole new organisms did not arise from mud. Most of life derived from the fertilized egg: “ovism” was accepted with a few exceptions that could not yet be explained on that basis. But the idea of spontaneous generation never died out completely. It became the basis for the idea of abiogenesis.

One species after another was found to have living ancestors. But granted that fact, it yielded no theory as to where the “first” one came from. Many could not see why that ruled out abiogenesis. Why could a new living thing not have arisen from inanimate matter at least once in the dim past and started the chain of life? Once creation was ruled out, what other alternative was there?

Toward the end of the eighteenth century, the French school of materialism rejected all “final causes or teleology” for living things. Its adherents proclaimed that the development of the cosmos is based merely on the laws of matter in motion. Consequently, living things could only arise from the chance interaction of this moving matter. And that rekindled the interest in spontaneous generation. Life had to start somewhere.

Around 1800 Jean-Baptiste Lamarck accepted spontaneous generation. It could have been the means whereby the physical forces that govern inanimate bodies once produced a living being. The difference between life and death is merely *a higher degree of organization of matter* in living things:

Nature has no need for special laws, those which generally control all bodies are perfectly sufficient for the purpose.⁸⁰

Now the adherents of spontaneous generation moved altogether away from the Christian religion and into the humanist camp. All of life was now seen as arisen through “material causes” only.

Spontaneous generation began as a scientific theory to “explain” the rise of some species for which no parentage could be found. Now it became more than that. It became the basis for a religious belief.

Pierre-Georges Cabanis was an ardent materialist and adopted the view of Lamarck. He propagated it with religious fervour in the post-revolutionary educational system in France. His type of education was:

...directed against prejudice, superstition, and the study of religion.⁸¹

In this way materialism became a belief in “nothing but” material things and forces that were independent of any other power. And “all else,” including living things, depended for their existence on *them*. Matter and its

“forces” were endowed with divine power of creation. And abiogenesis was its offspring.

For a while some held out against it on the basis of what Pasteur had shown: no new life arises in a sterile environment. But the experiments of Pasteur only applied to current events. Hence they did not conflict with the new theory, and soon the resistance from that direction dwindled.

From the beginning materialists hotly denied that theirs was a faith or religion. They maintained that they had struck upon the only really scientific approach to reality. All belief in non-material forces or explanations was rejected as unscientific, as superstition.

Humanism is consistent with many different forces, which can be seen as the cause of life arising from matter. But abiogenesis became the doctrine of the materialistic sect of the religion of humanism. Materialism tolerates no forces in the process of origin besides those studied by the physicist and chemist. That was the contribution of the French connection.

c. Marching on to victory

In Germany the school of George-Ernest Stahl taught that the soul directs the processes of life. Nature was seen as a unity in all its creatures. As C.J. Carus saw it, nature was “one vast and infinite life.” A living “geist” or spirit pervades nature.⁸²

The “Natur Philosophen” interpreted this unity in nature in the sense that there is no essential difference between non-living and living things. They could therefore accept spontaneous generation for infusoria, fungi and intestinal worms. Carl Rudolphi described over a thousand different species of such worms. J.G. Bremser stated in 1819 that he held:

...proven the spontaneous generation of moulds and infusorians from dead bodies...⁸³

just as it was “demonstrated” in the case of worms. He saw a primitive earth as endowed with a living “Geist” or spirit which did not yet consist of isolated living bodies. This Geist was the cause of their spontaneous generation.

These men could not accept abiogenesis since there is no inanimate matter. “Everything is endowed with spirit.” This was a form of vitalism again and amounted to *concrete animism*.

A great deal of experimental work was done on fermentation and cell division at the time. M. Schleiden described how the nucleus of a new cell arises from that of the parent cell. T. Schwann denied this. He did not believe in special biological powers. He rejected the “Geist” and professed his faith in materialism as follows:

...an organized body is not produced by a fundamental power which is guided in its operation by a definite idea, but it is developed, according to blind laws of necessity, by powers which, like those of inorganic nature, are established by the very existence of matter. As the elementary materials of organic nature are not different from those of the inorganic kingdom, the source of the organic phenomena can only reside in another combination of these materials.⁸⁴

He claimed that cells could arise in a solution of organic matter without the need for a parent cell.

The vitalists claimed that there is no inorganic matter. Everything is “spiritual.” Hence abiogenesis makes no sense. Schwann claimed the opposite: there is no organic matter. There is *nothing but* inorganic matter. Hence abiogenesis is an essential requirement for explaining life’s origin.

The famous pathologist Rudolph Virchow opposed any form of abiogenesis and stated: “Omnis cellula e cellula” – every cell arises from a cell. He felt that Schwann’s ideas would open the door again for the old doctrine of spontaneous generation which had been refuted so neatly by Louis Pasteur.⁸⁵

Around 1850 thinking in Germany developed in a way similar to that in France. Materialism began to gain more adherents. L. Buechner, Vogt and Moleschott proclaimed that:

...there are no other forces in nature besides the physical, chemical and mechanical.⁸⁶

From this magic formula they concluded that the origin of all living things on earth *must* have been the result of some action on the part of these forces. Again, forces, concepts abstracted from real things by theoretical thinking, are personified. They are assigned individual personal power to act and declared to have produced living things from inanimate matter. It is the old “bartering understanding for voodoo formulas” in the form of *abstract animism*. And so in Germany the idea of abiogenesis continued its triumphant march to victory among scientists.

d. The midwives of life

Many early biologists believed that living beings manufacture a special kind of matter – called organic – which man can never make. Some even thought that there is living matter: biomolecules.

In 1828 F. Woehler synthesized urea, one of such “organic” molecules. His colleague Buechner had always refused to see any distinction between organic and inorganic compounds on the basis of his materialistic belief. Woehler’s synthesis confirmed him in his view. He foresaw a time when man would synthesize matter to the point where he could make complex organic

matter. And that would lead to the manufacture of living things. Thus the idea of “creating life in a test tube” was born. From there on it was just a matter of time and increasing chemist’s skill, as he saw it.

In 1859 Charles Darwin published his *The Origin of Species*. Buechner was elated. Here was the support he needed. It offered a reasonable theory on the development of the species that could be used to refute the story of their creation. For him it was only a small step from that, to accept abiogenesis.

Many biologists had just been persuaded by the famous experiments of Louis Pasteur, published in 1860, that once and for all disproved spontaneous generation. They were now thrown in a turmoil by its apparent re-entry by way of the acceptance of abiogenesis. Others, never quite convinced by Pasteur, held on to the idea.

Ernst Haeckel believed that the simplest forms of living beings have no nucleus and can arise through spontaneous generation. In Britain T.H. Huxley had reached the same conclusion. He had been sent a clump of amorphous material, dredged from the floor of the Atlantic Ocean during the laying of a telephone cable. He believed it to be protoplasm, an early form of life, and baptized it *Bathybius Haeckelii*. And in 1869 John Browning stated:

There is no boundary line between organic and inorganic substances...between the lowest forms of living matter and dead matter.⁸⁷

Ironically, *B. Haeckelii* was later found to be an artifact, not protoplasm. But that did not faze Huxley or shake his faith.

Haeckel based a new *Naturphilosophie*, called Monism, on Darwin’s work:

- i. A vast, uniform, uninterrupted and eternal process of development obtains throughout nature.
- ii. This process is embodied in the doctrine of evolution.
- iii. Natural selection is the method for this development.⁸⁸

Schwann, Von Helmholtz and Emil du Bois-Reymond endorsed Darwinism with enthusiasm. And Darwin himself, always the cautious man in public and averse to personal confrontations, seems to have quietly accepted abiogenesis. In a letter to J. Hooker in 1863 he wrote that he regretted to have “trucked to public opinion” and not to have drawn the obvious consequence of his theory publicly. He admitted that his theory pointed *away from creation*, that “Pentateuchal term.” For he too meant to say that life must have arisen on earth “by some wholly unknown process.”⁸⁹

Gilbert Child, botanist at St. George’s Hospital in London, had more courage. By accepting the validity of the doctrine of evolution, he concluded that “Heterogeny,” i.e. abiogenesis, was a necessary consequence:

There *must* have been a stage in the development of the universe when the earliest forms of organic life were evolved from some special collocation of inorganic elements...⁹⁰ (e.a.)

It is interesting to note here that the theory of abiogenesis is *not* a logical consequence of the theory of evolution. Darwin described how one species of *living* things could have arisen from an earlier species of living beings. It does not follow logically that life had a *beginning*, let alone that it must have started the way abiogenesis describes it.

From a logical point of view, creation of the first organism is just as “consistent” with evolution as abiogenesis. They share their inability to prove their point of view through experiments in equal measure. That is the reason why there are many “theistic evolutionists” who accept evolution and yet reject abiogenesis. There is no *logical* inconsistency here.

Vitalists like Carus and Bremser believed in evolution. And they saw spirits in everything, fully capable of starting life without the need of physical forces, i.e. without abiogenesis. For this reason the “necessary” tie between evolution and abiogenesis amounts to a *logical* blunder. The religion of materialism demands the theory of abiogenesis. The theory of evolution does not.

There are three main concepts about life’s origin:

1. Abiogenesis: through the operation of purely physical forces.
2. Vitalism: through the activity of an all pervading spiritual force such as promoted by the Naturphilosophen and pantheists like in Hinduism and Buddhism.
3. Creation by a transcendent Creator.

Ever since the materialists formulated their principles of abiogenesis over a century ago, a vast number of scientists the world over have accepted it as valid. Very few today realize where these principles came from: the doctrine of materialism. And even less know or will agree that materialism is a faith, a form of religion. They still believe that they are working with a scientific theory. Even bible-believing Christians can accept it that way as we saw with the theologian Kuyper and the biologist Lever.

It took several decades before abiogenesis was accepted at large. Scientists were divided for some time, and the vitalists fought a brave battle in defense of vital forces (Hans Driesch) and *élan vital* (Henry Bergson). But their defense rested on a concept, abstracted from living things. Their defense was recognized by the materialists for the animism it was. We will demonstrate this from their writings later on. For that reason, their voices are now rarely heard.

Today, vitalism is considered to have died a quiet death in spite of a short-lived stir made by Teilhard de Chardin. And so the case room was cleared for

the midwives who were going to assist in the delivery of life from dead matter.

NOTES

79. Renee Descartes, *Discourse on Method*, Part 2.
80. John Farley, *The Spontaneous Generation Controversy from Descartes to Oparin*, (London and Baltimore: The Johns Hopkins University Press, 1974, 1977) p. 40. (Hereafter cited as *Controversy*).
81. *ibid.*, p. 43. Reference given: C.H. Duzer, *Contributions of the Ideologues to French Revolutionary Thought* (Baltimore: Johns Hopkins Press, 1935).
82. *ibid.*, p. 33.
83. J.G. Bremser, *Über lebende Würmer in lebenden Menschen* (Vienna, 1819) p. 53.
84. T. Schwann, *Microscopical researches into the accordance in the structure and growth of animals and plants*, English trans. H. Smith (London, 1847), p. 190.
85. J. Farley, *Controversy*, p. 54.
86. L. Büchner, *Kraft und Stoff*, 5th ed. (Frankfurt, 1858), foreword to 4th ed., p. xlix.
87. J. Browning, "On the correlation of microscopic physiology and microscopic physics," *Monthly Micr. J.* 2 (1869), p. 18.
88. J. Farley, *Controversy*, p. 76.
89. C. Darwin, letter to J.D. Hooker, 29 March 1863, in F. Darwin, ed., *The life and letters of Charles Darwin* (London: Johnson Reprint, 1969), vol. 3, p. 17.
90. G.W. Child, "Some aspects of the theory of evolution" in *Essays on physiological subjects* 2nd ed. (London, 1869), p. 144.

The Little Gods of Descartes

a. Commencing with objects that were the most simple...

We now know that materialism has conquered many scientific minds with its theory of abiogenesis. The next thing we have to find out is how all the processes it postulates to be facts could have come about. We must now ask for the method used by physical forces: how did they produce the first living being?

Astrophysicists believe that our planet is over four billion years old. Starting as a fiery globe, it cooled off and began to form water into vast oceans. Its atmosphere contained little oxygen. They “know” this because oxygen would have *interfered* with the processes to follow. It would have destroyed the building blocks of life, CH₄, NH₃ and other required chemicals.

Unfortunately conflicting theories abound on this topic. In some, the oxygen concentration was thought to be 250 times higher than in others.⁹¹ But that does not trouble the people who are dedicated to finding the material source of life.

In science one often makes a discovery which appears to contradict a current theory or paradigm. As Kuhn expresses this:

...nature has somehow violated the paradigm-induced expectations that govern normal science.⁹²

But that is not always a reason to alter a theory or to adjust it. In fact, says Kuhn, until nature is seen in a different manner,

...the new fact is not quite a scientific fact at all.⁹³

In biogenetic theory many anomalies have cropped up. Scientists have often had to adjust their “data” in order to maintain an entrenched theory. As a result this adjustment has become a routine fact of life. They usually no longer worry about it.

This unconventional attitude has been institutionalized by Miller and Orgel in their recent book *The Origins of Life on Earth*. After all, they emphasize, you must realize that our problems are very different from those encountered in other sciences. We can not test our hypothesis by running the processes which originated life once more through our laboratory. We must

...use different criteria in evaluating a theory...that deals with something that happened in the distant past.⁹⁴

What are these new criteria?

1. All astronomic and geological data must be consistent with our theory.
2. Each step postulated by the theory concerning physiochemical processes which led to life must be plausible in detail.
3. Each such step must be repeated in the laboratory if at all possible.⁹⁵

With this sound advice the method for the search is set.

We must first produce all the conditions that prevailed on primitive earth.

Then we need to assemble the building blocks necessary for life.

And finally we must, if at all possible, repeat the starting of a living thing in the laboratory. And the building blocks must be objects the “most simple and easy to understand...”⁹⁶ as Descartes advised.

It is now our task to see to what extent this advice has been followed and what the result has been.

b. In order to rise, little by little...

The findings in the natural sciences have been spectacular. Their application in technology and medicine have revolutionized our society. For that reason it is not surprising that the promises of those in search of the origin of life raised great expectations. They had no problems persuading their governments to erect and maintain large research establishments to facilitate such an exciting project.

Throughout the world thousands of the most capable scientists were pulled from basic research, from mathematics to astronomy and from physics to medicine. The cost has been astronomical. The data assembled have been astonishing and commensurate with the expenditure. What have they found?

First came the theories from the astronomers and astrophysicists, aided by recent space research. The earth is believed to be some 4 billion years old. It started out with an atmosphere containing hydrogen, some oxygen, and carbon and nitrogen. There was water, methane and ammonia. These were the basic building blocks. Physical forces pounded them violently: light-

ning, volcanic eruptions, radioactivity, ultraviolet radiation and cosmic rays. All this turbulent activity led to the formation of a “hot dilute soup.” Of course, all this is theory that can not be tested, since no one has yet invented a time machine that works backwards.

On this foundation, the chemists went to work in their laboratories. They tried to simulate what could have been the early ocean. They put in the basic chemicals and then began to pound it as required. Each step must be “plausible in detail.” And so they hoped to “rise, little by little, or by degrees, to knowledge of the most complex” as prescribed by Descartes.⁹⁷

This is what they have synthesized according to Dillon, using the methods recommended by Miller and Orgel:

1. All twenty amino acids found in proteins.
2. Nitrogenous bases and pentose sugars which occur in DNA and RNA.
3. 1-, 2-, and 3- phosphorylated nucleotides of sugars.
4. Polypeptides, the strands of amino acids which make up proteins.⁹⁸

One problem is the fact that many of these tests were carried out in the laboratory by clever people with the *direct intent* to produce certain chemicals. There was an “intelligence” at work. This of course is not the type of step prescribed by the method of Miller and Orgel. That troubles some scientists:

...an experiment designed to produce nucleic acids produces little else.⁹⁹

Another problem, rarely mentioned, is the formation of many types of molecules which would have interfered with the reactions needed for the origin of life.

As we have seen in Chapters V, VI and VII, even the smallest living thing contains an uncountable number of incredibly complex molecules that interact together in an incomprehensibly orderly manner. When viewed from that perspective, our chemists have only built the most primitive building blocks of these molecules. But they keep their eyes firmly fixed upon the future, from where the goal beckons. They are not dismayed that all they have done thus far is to “rise little...,” but very little.

c. Creation a la Descartes

We have not yet succeeded in synthesizing the complex molecules of our cells. But our chemists did establish the structure of a large number of them. Armed with that knowledge, they have put a package together for us to work with in our theorizing. The search for life’s origin has been given some material to speculate with about *how it could have happend*. From the various

models available, I have chosen one of the more recent ones, made by Lawrence S. Dillon.

First we have his assurance that life is simply:

...the capacity to synthesize proteins.¹⁰⁰

What does he mean by that? Let me make a similar statement from the field of physics: “gravity is the capacity to make satellites.” Dillon equates life with a capacity: the ability to make proteins. And I equate gravity with a capacity too: the ability to assemble satellites. What is wrong with that? We know that:

1. Abstract concepts are not functors. They “do” nothing.
2. Life, like capacity, is an abstract concept.

Therefore:

3. Both “capacity” and “life,” being concepts, can do nothing. In effect, Dillon must logically conclude:

4. Life cannot do anything!

So we are forced to conclude that his definition of life is a simple negation. We knew that gravity can not make satellites. And now our scientist has informed us that life cannot make proteins. While it appears to be true, that is clearly not the kind of statement which will bring us closer to understanding life’s origin as he intended.

With this profoundly non-informative statement, Dillon starts his scenario for the origin of life. Here it is:

1. Amino acids are constantly formed through physical forces in the atmosphere from their basic elements and carried down by rain into the oceans.

2. The amino acids combine to form strands as polyamino acids. We saw in Chapter VI that the sequence of amino acids determines the specific shape and chemical properties of each strand.

3. After millions of years, the oceans became quite rich in polyamino acids. And so it happened that two of them accidentally came into contact which were mutually compatible *and began to replicate each other*.¹⁰¹ The material for this reproduction was available in the surrounding ocean in the form of amino acids.

4. This happy marriage between two polyamino acids is supposed to fit his definition of life given above. It was the ability to synthesize proteins, which are polyamino acids. But “ability” is an abstract concept. To say that it can do something amounts to abstract animism. No wonder that Dillon’s definition implies that “capacity = life” can not do anything. However, he remains undaunted.

So this newly produced and very busy duo, says Dr. Dillon, “was the first living organism.”

5. The brand new organism was a slow performer because it took two hours to replicate itself. And half of its offspring was not even viable. But still, in the first year some 10^{200} replicas could have been “born” if enough amino acids were available.

6. This first species of living beings was of course subject to the same evolutionary forces that exist today. So it underwent mutation, genetic drift and natural selection. And so our little chemical machine changed into an ever more sophisticated one.

7. One of its offspring was so affected by CO_2 , ammonia, light and other physical forces that it mastered the trick of producing the amino acid glycine.

8. This new arrival on the scene was now “coupled with the prototype of a transfer RNA.” Dr. Dillon pulls this RNA out of his hat “through...interaction between the polynucleotides of the sea and a simple protein (the first tRNA ligase).”¹⁰² It was most considerate of these brand new molecules to show up in the immense oceans at exactly the right time and the right place. It is quite a hat Dr. Dillon wears.

And now this newly born couple immediately went to work at coupling more glycine with the new prototype of a tRNA. Once this combination of very sophisticated molecules had established itself, it turned out to have “high survival value.”

9. During the subsequent millions of years available, evolution continued to add ever more complicated functions to our molecular systems. More and more amino acids were added to the “catalog” they could produce and use. They began to manufacture mRNA molecules and a new variety of tRNA. And it was of course “... necessary not only to evolve a new variety of tRNA, but also a novel tRNA ligase *in order* to recognize and bind those two other new substances.”¹⁰³ (e.a.) It was quite natural that something new developed here because that was *necessary for the goal*, set either by nature, evolution or Dr. Dillon. Since the latter had not yet entered the stage, evolution is a blind process that acts at random and nature is not a divine power to a materialist, we are left in the dark as to who was responsible for all these purposeful and finely tuned events.

10. All these happenings occurred in the oceans, not in cells, because they had yet to be invented. So a “...suitable mechanism” for self-replication now had to be developed.”¹⁰⁴ This mechanism of course appeared at the right moment in time and is now known as the genetic mechanism. As expected, we are assured that it did not result from a plan – heaven forbid. It was entirely the outcome of “fortuitous events” and amounts to a collection of “...frozen accidents.”¹⁰⁵ And with a genetic mechanism in place, the molecular system could, after a suitably long period of time; develop all the other characteristics of a living cell.

Dr. Dillon is a brilliant scientist who has contributed much to our knowl-

edge of genetics. The data he uses for his scenario testify to his great scientific skill. They will undoubtedly find their beneficial application in medicine and elsewhere. But there are a number of problems. Unsurmountable problems. I will touch on several later on, but the most glaring ones must be pointed out here.

On page 412 of his book Dillon writes on step 2 of his scenario:

...two polyamino acid chains accidentally came into contact which were mutually compatible in such a manner that each could replicate the other (or, alternatively, a single self-replicating peptidoid molecule arose).¹⁰⁶

And in step 3:

This first accidental combination of two short interacting polyamino acid chains thus was the first living organism, according to the minimal definition for life provided above.¹⁰⁷

We noted above that his definition of life is no definition at all. This new statement is therefore also without explanatory value.

We have a more serious error here, however. The key sentence in the entire book of over 600 pages is the one quoted from step two. Two molecules bumped into each other, were compatible and *started to replicate each other*. Or, if they joined through a chemical bond, he says, *it became a self-replicating molecule*. As we will discuss in Chapter XII, this is not consistent with the established laws of physics.

But there is worse to come. Self-replication is one of the key characteristics of living things. Therefore to say that a new molecule began to self-replicate and “thus” began to live is logically false. It amounts to saying: “the molecule began to live and so began to live.” This is *petitio principii*: begging the question. The conclusion is contained in the premise.

This type of talk has no place in serious science. To call it rational would be a misnomer. Rather it is what a friend of mine, who is a professor in philosophy, calls a “philosophical howler.”

And so creation that builds, starting with the simplest to the most complex, à la Descartes, fails to give us an explanation of the origin of life. Dillon lets his first organism arise from water like Aristotle lets animals crawl out of mud. The only difference is that with Aristotle it happened all the time and whole eels appeared. It takes Dillon a few billion years to produce a lone little self-replicating molecule. His act of creation leaves much to be desired, while following the advice of Descartes.

NOTES

91. S.E. Aw, *Chemical Evolution* (Singapore: Singapore University Press, 1970), p. 12,13.
92. T.S. Kuhn, *The Structure of Scientific Revolutions* (Chicago: Chicago University Press, 2nd ed. 1970), p. 52.
93. *ibid.*, p. 53.
94. S.L. Miller and L.E. Orgel, *The Origins of Life on Earth*, (Englewood Cliffs, N.J.: Prentice Hall 1974), p. 1,2.
95. *ibid.*
96. Renee Descartes, *Discourse on Method*, Part 2.
97. *ibid.*
98. L.S. Dillon, *Mechanism*, p. 36,37.
99. John Keosian in K. Dose et al. eds., *The origin of life and Evolutionary Biochemistry* (New York: Plenum Press, 1974) p. 228.
100. L.S. Dillon, *Mechanism*, p. 411.
101. *ibid.*, p. 412.
102. *ibid.*, p. 413.
103. *ibid.*, p. 414.
104. *ibid.*, p. 414.
105. *ibid.*, p. 426.
106. *ibid.*, p. 412.
107. *ibid.*, p. 412.

The Hand of the Dead on the Cradle of Life

a. the Cradle that Engels built

“The major practical reason for studying the origin of life is that we cannot understand life without this study and, if we cannot understand it, we cannot control it.” J. Bernal.¹⁰⁸

This urge to *control* life motivates many scientists. And as Bernal sees it, we must first know where it came from before we will be able to exercise this control. So on with the search for its origin.

In the previous chapter we followed the trail that led from Descartes to Monod and Dillon and ended up at a sign stating: “not a through road.” Their method promised no solution. What else has been done to find it?

We will now take another road towards the goal we seek, one that has many signs alongside it stating that this is it. We will also find many fellow travellers on the way. It is a popular road. It was first charted by Georg Wilhelm Friedrich Hegel, and work on it began with our old friend F. Engels, whom we first met in Chapter III.

Engels wrote *Dialectics of Nature* over one hundred years ago. J.B.S. Haldane, a British-American communist biologist, wrote a foreword for the first edition of its English translation. And it is immediately evident here that Engels had ambitious plans. Haldane quotes him writing to Karl Marx on Nov. 23, 1882, that he had made an important discovery:

...it is a general law of motion which I was the first to formulate.¹⁰⁹

Engels puts his general law this way:

All qualitative differences in nature rest on differences of chemical composition or on different quantities or forms of motion (energy) or...both.¹¹⁰

He states that a change in quantity causes a change in quality. That is a law of nature and the first of his trio of the laws of dialectics. These laws

were not dreamed up by Hegel, he says. It is the other way around. They really exist, for us to discover:

...it is therefore, from the history of nature and human society that the laws of dialectics are abstracted.¹¹¹

Engels had a simple explanation for everything:

Motion,...the inherent attribute of matter, comprehends all changes and processes in the universe, from mere change of place right to thinking.¹¹²

Here we find old Engels already on an animistic bend, one of the abstract variety. He abstracts the concept of motion and ascribes it the power to do all changing in the world, "right to thinking." On the quicksand of obsolete animistic speculations, Engels builds his "general law." He puts all that was held to be certain before on the skids. Cause and effect, identity and difference, "categories" like the cell, the individual, the species, all become "untenable." He could not have been more radical.

There will be only one *absolute* left:

Dialectics divested of mysticism becomes an *absolute* necessity for natural science...¹¹³(e.a.)

Also:

...*chemistry leads to organic life* and...*it alone* will explain to us the dialectical transition to the organism.¹¹⁴(e.a.)

With this he gives chemists their task in life.

We will leave the philosophical meanderings of Engels here. Instead, we will join one of his most ardent pupils from now on along the trail which Engels so boldly blazed. Let us check this pupil's claim that it leads to his goal: to discover the cradle of life.

b. Laws of nature made by decree

In 1922 a young biochemist named Aleksandr Ivanovich Oparin gave a lecture in Moscow on the theory of abiogenesis. He asserted that there is no essential difference between coagula, i.e. inanimate matter, and the protoplasm of the living cell. He elaborated further on this in a book, published in 1924.

In 1925, Arthur Kendal, a chemist, publicly supported Oparin's claim. He declared that to assume a difference in kind between chemical compounds and the dynamics of the colloid in cells is merely the result of a "mental barrier."

In 1927 the chemist V. Vaughan addressed the U.S. Chemical Society and stated that life is fundamentally chemical. The English biochemist J.B.S. Haldane joined in agreement. And the American geneticist H.J. Muller added that life began with the appearance of the first gene, a molecule. Clearly the mechanistic approach to life's origin, which had its heyday in the France of a century earlier, was gaining ground in England and America.

Until 1929 the Russian biologists thought along the same lines. None of them belonged as yet to the communist party. They were "mechanical materialists." Stalin told them in that year to change their attitude and to *make biology consistent with dialectical materialism*. They had to "clean up their act."

As Farley narrates on those days, Oparin dutifully changed over from mechanical to dialectical materialism on command.¹¹⁵

In a book *On the Origin of Life* published here in 1938, he tied the discussion of origins to "the underlying struggle of social classes." He further explained that Engels indicated the only correct way for solving the problem of the origin of life. Engels had taught that life has not existed from eternity. But neither could spontaneous generation be accepted. Life:

...must have, therefore, resulted from a long evolution of matter, its origin being merely one step in the course of its historical development.¹¹⁶

We find the same reasoning here that led Darwin and his contemporaries to postulate the necessity for abiogenesis. We reported on that earlier on. And for the same reason given there we know that this is not a logical necessity.

In a more recent book (1962) Oparin tells us why materialists like to study the problem of origins. They do not merely look for:

"...an understanding of the very essence of life," they also want to learn how to "alter living nature purposefully in a way favorable to mankind."¹¹⁷

Oparin too wants to find life's origin in order to "control" it as Bernal suggested. We do not need to elaborate on why Soviet scientists want to "alter living nature." Is it because they thirst for scientific truth?

True to Engels, Oparin developed a specific type of approach towards the problem of life's origin. His theory had to be consistent with Engels' animistic belief that the concept of motion can alter the laws of nature. Oparin applied this by emphasizing the *emergence* theory.

Matter, he says,

...proceeds through a series of stages of development,...life came into being as a qualitatively new form of motion.¹¹⁸

The old laws of physics continued to operate, now “supplemented by new and more complicated biological laws....” All this happened without a specifiable cause. Life is “material in nature,” yet it is unique:

This is a special form of the movement of matter, qualitatively different from that of the inorganic world....Therefore the dialectical materialist will even formulate the problem of understanding life in a different way from a mechanist...¹¹⁹

Our friend smoothly slides over the “qualitative difference” between physical and biological laws. This is as prudent as it is effective with an audience that is ignorant of such fine and obscure distinctions. Why attempt to give an answer you don’t have, to people who don’t even know there is a question?

A touch of mystery, of animistic faith, no doubt inspired by the “world spirit” of Hegel, moved via Engels down to Oparin. New biological laws *emerged* as the *necessary consequence* of the dialectical development of matter in motion. They appear by *decree* as ordered by those with the power to issue such orders. So now Oparin merely has to solve some practical problems facing him in a dialectical manner. How does he pull these new laws of biology out of his magician’s hat?

c. The man who was there

We saw that Oparin began by listening to his master’s voice. From Engels he received the laws of nature that fashion living things. But after that he was on his own. Chemistry in the days of Engels was not quite what it is today. So now he had to put those special “laws on the movement of matter” to work.

He began with scrutinizing all the models that had been offered by his fellow travellers on the road to the origin of life. He found most of them wanting. He rejected the theories advanced by scientists such as J.D. Bernal and S. Fox and settled for the solution offered by a Dutch biochemist.

Bungeberg de Jong worked with coacervate droplets, small drops of a solution of organic material such as amino acids, nucleotides and carbohydrates. From this trio a cell makes proteins, DNA and most other molecules it needs. Oparin assumed that these drops must have appeared spontaneously in the early oceans with all the chemicals mentioned. The reason for this was simply that he needed a model for a “precursor” of the cell. And the coacervate drops seemed to fit his bill just right.

Next he outfitted these little drops with the ability to concentrate these substances quite effectively. Again, he assumed this because his scenario

required it. And when not magnified too much, the drops indeed do vaguely look like cells. Because of this resemblance, Oparin decreed that this was what he was looking for. Protoplasm, he stated, is:

...from a physico-chemical point of view, a multiple, complex coacervate.¹²⁰

On page 82 and 83 of his book (1962) he proceeded to tell us in great detail how life evolved from such humble beginnings. And he spoke with great authority. It was the authority of one who had the revelations issued by men of great insight such as Hegel, Engels and Joseph Stalin. He used scientific language and told his story so well that he gave the impression of the man “who was there.”

His chosen droplets were floating in a suspension of various chemical compounds in the early oceans. He now asserted that some of these *outside* compounds *must* have passed *selectively* through the surface of the drops. And to whom was the delicate job of active selection assigned? To the chemical compounds that happened to float around *inside* of the drops – the molecules, whose presence he had so cleverly just arranged. Of course, as he had assured us before, these proteins and other “building blocks” also got there by pure chance. No planner and no plan were involved. He animated his molecules himself.

We have a few little problems here. How do amino acids, carbohydrates and nucleic acids get together here, exactly where and when they are needed by a cell that has yet to be born? And how do we get ordered, *selective* functions out of material particles that float around at random? These questions have bedevilled all theories in this area. They do again here. But that did not worry Oparin.

He simply declared that together they began to form a “system.” We are not told how. But *that is the key question* requiring an answer he could not provide. Instead, he quickly jumped over the hurdle and proceeded to complete his scenario for the origin of the first living being on earth.

1. These systems acquired a physico-chemical *organization* which *impressed* its “own stamp on the chemical reactions which went on inside...” Dr. Oparin abstracts his own invention – organization – and gives it a personality. Then he assigns it the power to “stamp” impressions on chemical processes. Apart from creating a mixed metaphor, he commits himself to abstract animism. There is more to come.

2. These systems now had to be sorted out. Some were no good for his purpose. So he declares that only those drops survived:

“...in which the organization was suited to the task of maintaining the existence of the particular *organism*...”¹²¹

Where does this organism suddenly come from? No answer here.

Those “organisms” which could not survive did not survive. What can not live can not live, Oparin says. Does that explain anything?

We see the origin of life enfolding in the picture painted by our good doctor:

1. In the vast oceans, containing a host of chemicals, moving at random, coacervate drops begin to form by chance.

2. These suspended drops receive the gift of self-organization by chance and become “systems.” These then begin to actively select and absorb building material.

3. Suddenly the *systems* are found to have become *organisms* and the processes of “natural selection” can begin its work of separating the good from the bad. And so Oparin sets evolution on its course.

Unburdened by the laws of physics, our guide leads us up his path. He does it in a clever manner, and many a brilliant mind who was not looking closely accepted it for truth.

The story Oparin tells us distinctly reminds us of the legend of Count Potemkin. This Russian nobleman extracted so much tax from his subjects that he reduced them to abject poverty. Their villages were a scandal to behold. One day he was informed that his empress, Catharine the Great would pay him a visit. He was a bit worried that she would find out how he treated her loyal subjects. But he knew that her eyesight was not too good. So he ordered a series of large pictures to be painted that showed beautiful mansions and other signs of prosperity. These he had erected alongside the road the empress would come. His ruse was successful and she never found out the truth about her count.

We too are in search of the truth. We look for scientific truth. So we must always ask: “where does science end and fiction begin?” Without sound scientific evidence, we will not be misled by stories, even if the gifted narrator paints beautiful word-pictures and makes it sound like he is the man “who was there.”

d. Honor to the Creator

We can omit the further details of Oparin’s scenario, since his explanation of life’s origin is not based on scientific observation. Rather it hails from the political philosophy of Friedrich Engels, a cotton manufacturer by profession and a biological dilettant of one and one half centuries ago. Now some one is bound to ask: “Why should we spend so much time on the view of Aleksandr I. Oparin?”

In 1974, fifty years after he published his first work, and when he celebrated his eightieth birthday, Oparin was honored by a large volume, written by his admiring pupils, edited by some of the most distinguished scientists in

the world in his field and published in the U.S. The contributors hailed from many countries and their articles were written because:

...The distinguished merits of A.I. Oparin in the formulation of a materialistic theory on the origin of life have been widely recognized.¹²²

After the formation of the International Society for the Study of the Origin of Life, ISSOL, he became its first president. In early 1974 his works on the theory of the origin of life were also honored with the most prestigious prize of the USSR for scientific and artistic activities, the Lenin Prize.

At the second meeting of ISSOL, held at Kyoto in Japan in 1977, Oparin contributed a leading article, in which he again made the unexplained jump from a random conglomerate of matter to a coordinated system that lives. This followed the publication of a book of 463 pages on *Molecular Evolution, Prebiological and Biological*, edited by D.L. Rohling and A.I. Oparin in honor of Sydney W. Fox. This American scientist did much experimental work with microspheres containing the supposed components of the probiotic oceans.

Hardly a work has appeared lately on abiogenesis whose author has not paid his respect to Oparin, has not devoted a great deal of space to his views, or carried a foreword by him.

In 1957 the first meeting of the International Symposium on the Origin of Life was held in Moscow. A number of American scientists proposed a mechanism for abiogenesis that differed from that of Oparin. However, Oparin's view was shared by Americans such as S. Fox, E. Chargaff and S. Miller.¹²³

At the four subsequent meetings, Oparin's position has become virtually unchallenged. As a result the package of his animistic views on the origin of life, based on the political dialectics of Engels, have come to rule the thinking of hundreds among the world's leading geneticists and molecular biochemists.

The honors conferred upon A.I. Oparin have even been carried by a representative of NASA headquarters in Washington, D.C., the U.S. space agency. In a book mentioned above, honoring Fox: *Molecular Evolution*, R.S. Young of NASA wrote an article: "Space Exploration and the Origin of Life." He stated:

In *Priorities for space research, 1971-1980* (1971), the Space Science board of the National Research Council concluded that 'the highest life sciences priority in space is the search for extraterrestrial life and for the fundamental understanding of life's origins.'...Because all present biology is based on the evolutionary sequence that occurred on earth, the discovery of life on another planet could revolutionize the field of biology.¹²⁴

This is of course a gross misrepresentation of the facts. It is simply not true that the field of biological investigation, including its most important applications in medical research, is based on the "evolutionary sequence." In fact, medical textbooks do not mention the evolution of life from Oparin's primeval oceans, nor any other speculation on the origin of life on earth.

R.S. Young and many an engineer or astrophysicist is clearly not familiar with these fields of science. But then, most of the research done in this area is carried out by practitioners of the sciences that deal with inanimate matter: physics and chemistry. It is not easy for them to understand the "facts of life."

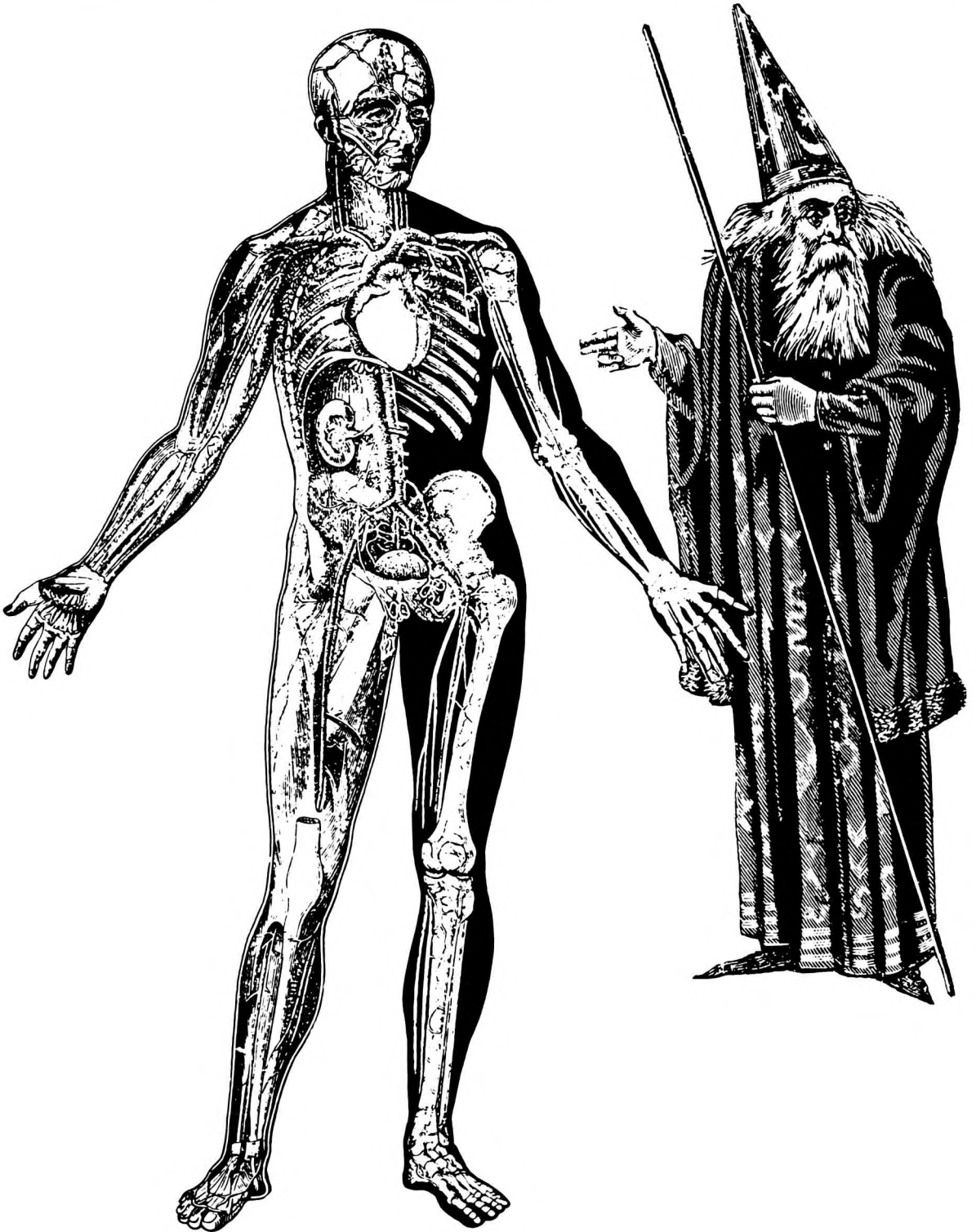
From all this it appears that dialectical materialism as the driving force of Marxist theory has been accepted worldwide in its application to the theories on life's origin. This testifies to the power of ideas when carried by a man, possessed of a strong religious conviction, expressed in an eloquent manner, and presented with a semblance of scientific truth. And so it is, that Aleksandr I. Oparin is honored as if he were the witness of creation and rocked the cradle of life.

NOTES

108. J. Bernal, quoted in D.L. Rohlfsing and A.I. Oparin, eds., *Molecular Evolution, Prebiological and Biological*. p. 1.
109. J.B.S. Haldane, quoting Engels in his preface to the English translation of: F. Engels, *Dialectics*, p. x.
110. *ibid.*, p. 27.
111. *ibid.*, p. 26.
112. *ibid.*, p. 35.
113. *ibid.*, p. 154.
114. *ibid.*, p. 157.
115. J. Farley, *Controversy*, p. 172.
116. A.I. Oparin, *The Origin of Life*, trans. Sergius Morgulis (New York: Dover Publ., 1938), p. 33.
117. A.I. Oparin, *Life, its Nature, Origin and Development* (New York: Academic Press, 1962), p. 5.
118. *ibid.*, p. 6.
119. *ibid.*, p. 7.
120. *ibid.*, p. 71.
121. *ibid.*, p. 82.
122. K. Dose et al., eds., *The Origin of Life and Evolutionary Chemistry* (New York, London: Plenum Press, 1974), p. 5.
123. Farley, *Controversy*, p. 179.
124. D.L. Rohlfsing and A.I. Oparin, eds., *Molecular Evolution*, p. 62.

Part Four

What Do We Really Know?



How We Look At Things

a. Numbers

What we have found up till now has been very disappointing from a scientific point of view. All we have seen is a growing wealth of data on the chemistry of the cell. About the origin of life we have seen nothing of any scientific value. We were merely inundated by metaphysical speculations and animistic propaganda. But, we are not giving up yet. We are still searching for a scientific theory explaining the origin of life.

After what we have discussed before, we can now formulate the question as follows: “Can a collection of individual functors of a physical nature, consisting of atoms and molecules, ever give rise to a living functor through mere physical action?”

For an answer to this question, we must explore the real relationships between physical functors. And we must try to do this without the speculations that have given such unsatisfactory results as we discovered.

What do we do when we observe the world around us? When we look at functors, we immediately begin to do some abstracting in our mind. This is such a common experience that it is easily overlooked. But that is exactly what we must concentrate on for a few minutes if we are ever to break the deadlock science has reached. Let us for instance look at a basket with eggs.

Each egg is an *individual* functor which, if it contains a living embryo, can develop into a chick. Through *common sense* we know that we cannot divide it into smaller units without destroying it as an egg. This knowledge forms one of the cornerstones of all we can know. It is fundamental for our ability to think as humans.

There are many functors which we can not divide without destroying them as the functor we know them to be. We call each of them *one* individual functor. This “one” is a concept. We *abstract* it from the egg we see. And by intuition we know that each of the eggs in my basket is *one* other individual functor, distinct from the rest.

Next we abstract the concept of two from a combination of “one” egg and “one” other egg. That is the beginning of the very abstract business of counting: working with numbers.

Numbers do not exist as real things. Numbers are not functors. They are concepts. When we see one egg we experience this individuality of “one” as a *mode* in which it displays itself to us. It is the way or mode one individual egg exists. We experience this mode of being as a numerical mode. We call it a *numerical aspect* of our egg.¹²⁵

When we break an egg, we get several *fractions* of the shell: to “fracture” is to break. And then we have a gob of yolk and egg white. Thus the result of dividing the functor called egg is a *number of fractions*; but none of them is an egg. *We can not divide an individual functor without destroying its being ONE functor*: we get “more than one.”

We can certainly divide numbers into fractions. We can do that because numbers are concepts and not functors. Each fraction again represents the concept of one: it is *one* fraction. We can divide numbers ad infinitum, but each new fraction is *one* fraction. This leads us to conclude that: we cannot divide a number into something that is not an individual number. The numerical aspect is the most basic aspect of functors we can find. WE CAN NOT REDUCE NUMBER TO SOMETHING ELSE that is not a number.

b. Space

We can make a “model” of the number one by putting a dot on a piece of paper. One is not a functor; it is a concept. But the dot is real: we can observe it. Now we put another dot ten inches away on the same paper. As soon as these two points sit there *at the same time*, we experience their relation as one “in space.” They are removed from each other by a certain distance. *Spatial relation expresses simultaneous extension.*

I did not invent the relationship between these points as a spatial mode of being. I can only *experience* it as a basic mode of how two or more functors relate at the same time. Without functors I can not think of space. *Spatial extension is another aspect* we can abstract from real functors besides that of number.

Like number, *space does not exist* by itself. For centuries scientists theorized that space did exist as a functor called ether. They needed it for explaining the interaction between distant functors such as planets.

Newton introduced the concept of gravity, a force which acts at a distance without the need for ether for its transmission. For a long time some scientists rejected the notion of action at a distance through a vacuum as “occultism.” But today space is no longer seen as “filled with ether.” It is a concept, not a functor. It is another mode of being which we experience

when we say that something “occupies space.” To declare that space exists as a functor or substance would amount to animism again.

Now let us make a model of a spatial relationship by connecting two dots on paper with a straight line. That gives us a one-dimensional relationship in space. We can add a third point on our paper and make a two-dimensional model like a triangle. And we can make a three dimensional model with sticks or wire and produce a cube.

In mathematics we work with abstract concepts as models. That is why we can think of an infinite number of points between two fixed points. In real life we work with real functors. There we can not put an infinite number of dots or eggs between two dots. The reason: real functors “take up space.” When we try to put ten eggs in a row between two points ten inches apart, we get into trouble right away. We find that our ten eggs together take up a space of perhaps twenty inches. Their combined spatial extension is too large: they don’t fit in the ten inches. Real functors display their own aspects that we can not ignore.

In mathematics we work with abstract concepts as models. We can “fill” a concept with concepts but a concept never gets “full.” That is why the concept of space can never be made “full” of numbers. An infinite number of numbers or their fractions will never change into space. We can not “build” space by adding a large number of “points.” For this reason WE CAN NOT REDUCE SPACE TO NUMBERS. This may seem a far-fetched statement. But it will become clear when we see how materialists try to reduce life to material forces or energy.

c. Things are moving

When I tip over my basket, the eggs start rolling. But they *take time to move*. With space we saw time appear in the concept of *simultaneous* extension. Now we see time *in motion*. Motion is another concept which we abstract from the world of real functors. Each egg moves from one place to another and the distance between the ten eggs *changes*. Motion is as different from spatial extension as moving is different from standing still.

Again we can represent what happens graphically with a model. We can draw the egg’s courses with a pen on paper. We can also take snapshots of them at different times and note the differences in their mutual distances.

We know that the course we drew for each egg is not a real functor. It is just a model, a picture. *Motion does not exist* by itself. It is not a functor with functions. *Motion does not move. Eggs do.* Motion is an abstraction like space and number. It is a concept and represents another aspect of functors.

We could conceive of numbers without needing time in our thinking. We did need the concept of time for spatial extension: we had to have a mini-

mum of two points, seen *at the same time*. For motion we need a further idea about time: its *continuously moving "flow."*

After the eggs *changed* location, whether we saw them rolling or not, we know that they *must have moved*. We also know that this *change in location takes time*. A function which as a concept needs a continuous flow of time for our understanding is intrinsically different from one that merely requires simultaneous existence. This indicates that the abstract concept of motion cannot be thought of as a result of an addition of different distances at numerous "points in time." I cannot add numbers and create space. In the same way I cannot add distances and get motion. Motion is not a special case of extension in space.

We must therefore conclude that **THE ASPECT OF MOTION CANNOT BE REDUCED TO THAT OF SPACE.**

d. Time for action

There are no natural functors that display only the aspects of number, space and motion. Points, lines, planes and cubes or globes remain pictures or models of the concepts we have abstracted from real things. Real functors display an additional aspect which we call *physical interaction*. And "to be real" means existing for a *period of time*.

Each entity which displays physical properties is a *real* functor. It interacts with other functors and we observe these functors in the functions they display. I could not see my eggs if they did not interact with me in a way that makes me perceive them. Nor could I know that they were eggs – and not round-oval stones – if no chick would ever crawl out of them. That is the way normal eggs *interact* with the world.

Physicists have discovered four basic ways in which physical functors interact. They are gravity, electro-magnetic, weak and strong nuclear *forces*. Some expect that these can be unified into one singular force in a "grand unification theory" (GUT).

All physical phenomena we observe, such as refraction of light, centripetal motion etc., can be reduced to a display of one or more of these four basic forces. They express the lawful interactions of individual functors. The various relations between these functors are commonly referred to as *forms of energy*.

Every observable entity interacts with all other similar entities. Every functor in the universe, whether it be a star, a pebble or an electron, interacts with all other functors. But the force of this interaction may be too small for us to measure.

Some functors combine with a great many others to form larger functors. There are untold millions of molecules in a planet, a glass of water or an

elephant. And each individual molecule is a collection of smaller functors. Such collections of functors are often called systems.

The forms of physical interaction are called energy. *Energy does not exist* apart from a physical functor. It is an aspect of such a functor just like number, space and motion. It is one of its modes of being which it displays for us to experience.

We can separate the aspect of energy from the other aspects in our thinking. Yet, we can no more detach its energy from a real functor than we can take away its numerical values, its spatial relations or its aspect of motion. *We only know of aspects by abstraction.*

We now have arrived at the end of the road on which the materialist walks. We now know that:

1. The numerical aspect needs *no involvement of time.*
2. That of space requires the introduction of *at the same time.*
3. Motion in addition needs the *flow of time.*
4. The aspect of energy or physical interaction requires *real functors* for our understanding. And they must exist for a *period of time.* This indicates that **THE PHYSICAL ASPECT CAN NOT BE REDUCED TO ANY OF THE OTHER ASPECTS.**

We need physical functors, from electrons to galaxies, with their display of energy while interacting, in order to experience anything. Without this experience of interaction with other functors we could not perceive them. But any functor we observe this way must also display the aspects of number, space and motion.

Each functor shows all four aspects in full integration at the same time and at all times. But each type does so in its own unique way. Each follows its own idionomy.

So now we have separated four concepts, called aspects, from all the functors we observe. And none of them can be reduced to the previous one. Each represents a unique way of being which we experience as a unique mode of perception. Each is an irreducible *modal aspect* which the individual functors in creation display. Each represents a facet of *the way they are.* And when we separate them in our scientific analysis they represent *the way we look at things.*

NOTES

125. A more elaborate introduction to the theory of the aspects of reality and the general philosophy of Herman Dooyeweerd can be found in L. Kalsbeek, *Contours of a Christian Philosophy*, Bernard and Josine Zijlstra, Eds., (Toronto: Wedge publ. Foundation, 1975).

The Things We're Looking At

a. In unity is strength

Modern theories on the origin of life are based on properties of atoms and molecules. For that reason we must acquaint ourselves to some extent with the main features of this “small world.” I have taken most of what follows from a recent book *Time and Again*, “A systematic Analysis of the Foundations of Physics,” by M.D. Stafleu. It deepens our insight by dealing with most difficult subjects in clear language.¹²⁶

Many of the ideas about matter in classical physics have had to be changed. For instance gone is the idea of matter as a collection of indestructible little billiard balls bouncing back and forth between collisions.

Subatomic particles are no longer just protons, neutrons and electrons. We now hear of dozens of different particles and their counterparts, of wave-packets, of particles with a “thing-like” character and others that look more like “events” at times.

In spite of all these changes in our understanding, many scientists are convinced that all these minute particles are individual functors. As Stafleu observes, a scientist must still have an individual functor to investigate before he can theorize about its functions.¹²⁷ Physicists have discovered that each type of these particles displays a specific combination of functions. And in all these functions they are governed by specific laws. That is how we can recognize their type.

All particles function actively in all the four aspects we have discovered thus far. They all display a numerical aspect; each individual particle is a unit of one. If it contains more than one particle, such as an atom with its nucleus and electrons, it has additional numerical values. The same holds for the spatial relations with other functors, for their relative speed and for the value of their individual energy states. They all function under their laws, their very own idiom. And while they are small, they are quite real.

We cannot speak of an individual functor unless it shows some degree of:

1. Permanence for a period of time.
2. Coherence – what keeps falling apart cannot remain one functor.
3. Stability. Since atoms and molecules display continuous periodic motions, their combined total in a functor must be stable through some form of bond.
4. Reality. Functors can be said to be real if we can observe that they interact with other functors.

Stability does not mean absence of change. For example it is believed that an electron continually interacts with an electromagnetic field. In this process photons are emitted and absorbed and pairs of electrons and positrons are created and destroyed. There is a continuous change going on in the world of these minute particles. Some new ones arise and others are destroyed. And throughout they display intermediary states of energy.¹²⁸

The constantly changing energy state of particles leads to the introduction of statistics. We can not determine the behaviour of an individual particle. We can only discover the laws of probability as they apply to “all like” particles.¹²⁹

Because we discover these laws and can count the particles, we must assume that they do have an individuality. But we can only deduct individual function from that of very large numbers.

We know of three ways physical functors can interact.

1. They can lose their individuality through absorption. Light quanta can be absorbed by an atom, electrons by a nucleus.
2. Some retain their individual existence and independence as in solutions, mixtures and aggregates. No new systems are formed.
3. Others combine to form a new functor without losing their own individuality as functors. Protons and neutrons form nuclei together; a nucleus can join with an electron and form an atom; atoms combine to form molecules and molecules can form solid crystals.

In the latter cases we can see the formation of really stable functors. They show that unity, even for subatomic particles, means strength.

b. Millions in chaos

When I dissolve an ounce of kitchen salt in a pan of water, I destroy the individual salt crystals. These functors desintegrate in the process of dissolving. Instead I produce a collection of molecules of NaCl, all separate functors. And when some of them dissociate into Na⁺ and Cl⁻ ions, we have them as additional functors. These new functors display the following characteristics:

1. The *number* of salt molecules and its ions is finite although hard to count accurately. It is set initially by me. The relation between the number of water molecules and those of the salt is accidental and varies with outside factors such as the properties of the pan, temperature etc., e.g. the water can evaporate.

2. The *spatial* relation, i.e. the distance between the components at any moment in time is equally accidental and distributed at random.

3. The *speed* of the various constituents of my solution is always accidental and variable. They move as determined by outside factors like temperature and pressure.

4. Again, *energy* is distributed over the particles in random fashion and their mutual interaction occurs equally at random.

In all four aspects our particles function as separate functors. Their dissociating through ion formation only increases their number.

When I dissolved my salt, I did not produce new elements. I still had the same salt atoms. But their bond in crystals disappeared. Thus I produced a new type of functors with different characteristics. They no longer remained in the fixed mutual relationship like in the crystal. They now became free to interact as described.

The new situation amounts to an accidental collection of functors who function purely at random in all their aspects. We cannot predict the way an individual particle will interact. For the individual there seems to be no order but utter probabilistic disarray. Their total number is ordered by the laws of probability. But it is an order that holds for what appears to be millions of particles in chaos.

c. A different bowl of soup

The salt molecules in my pan still display some degree of order. If we isolate them as best we can from outside influences, we can establish some regularities.

When I pour billions of *different* atoms and molecules contained in a few grams in my pan, things get really complicated. All kinds of chemical reactions are bound to begin.

Each type of atom and molecule has its own structure and idiom. That means that each of these particles can form a chemical bond with any of the others, depending on the multitude of factors that regulate these interactions. Some of these factors follow:

1. Many a new particle will be formed that can slow down the interaction between other particles, unrelated to itself. Others can speed up certain chemical reactions between particles without changing their own structure

in any way. The slow-down artists are called *inhibitors* and the speeder-uppers are catalysts or *enzymes*.

2. If the new arrival on the scene is an enzyme, it will convert all suitable molecules within reach into a different type. This will of course eliminate all reactions in which the now converted molecules could have been engaged before their conversion. And these new molecules in turn may set off other reactions that heretofore were not possible.

3. A strong electrical current can set off a whole chain of chemical events.

4. Boiling or freezing can bring about the most unforeseen reactions.

5. Great bursts of ultraviolet radiation from the sun, cosmic radiation, sudden nearness of a radioactive body and the like can add to the confusion.

But no matter how complex the structure of any new molecule in my soup, it will obey its own laws, its own idionomy. For instance a number of amino acids that somehow got linked up in a long chain will not form a straight line. Instead, the new molecule will curl and fold somewhat like a fishing line in a "birds nest" when you wind it with too much slack. The way it folds is prescribed by the mutual attraction and repulsion between its various constituent amino acids.

In the same way each new molecule will obey the laws or idionomy that govern its interactions with other particles.

Regardless of the size of the container, all the constituents of the mixture are governed by the physical forces in a completely random fashion. That includes all chemical reactions. The laws of probability merely account for:

1. The spectrum of reactions possible at the same time;

2. The statistical distribution of these possibilities in their relative frequency of occurrence.¹³⁰

Under the laws that govern the interactions between them, these small particles can only form new physical particles. Those laws hold in oceans, filled with untold numbers of the most complex compounds. *They also hold in small droplets* of organic matter, floating in such oceans. The only difference is that in these droplets the number of constituents is infinitely small compared with that in the ocean. Consequently the number of possible compounds that can be formed in these drops is severely limited. But they too are governed by the laws of probability. Their molecular interactions occur just as much at random. And the result is just as much one of probabilistic disarray.

Our conclusion must therefore be that physical interaction between physical functors can only yield the formation of new physical functors, even in a bowl of soup. Let us now take a look at some new theories about a possible transition from matter into living things. Let us examine what are often called physical systems.

d. The nuts and bolts of machines

My 1972 Pinto still runs quite well and serves its purpose: to get me from here to the shops and back. It functions beautifully for such an old car. For that reason I call it a good functor. It is a nice mechanical *system* for getting around.

The word *system* has many uses: from mathematics to physics and from philosophy to religion. It has a particular attraction for biologists and is often used in connection with the concept of abiogenesis. When discussing the theories of Oparin we ran into “systems”: his coacervate droplets were going to be the new systems, to be changed into cells. There are others. For this reason we will have a closer look at it.

My Oxford dictionary devotes seven columns to the word *system* and its derivations, indicating its many uses. The two main meanings are:

1. “An organized or connected group of objects.” One example given is: “A group of bodies moving about one another in space under some particular dynamical law, as the law of gravitation...” That defines a functioning whole like our solar system. It can also be applied to a living cell which contains many “bodies,” molecules, moving about under “dynamic” laws. Thus “system” here means a *functor*.

2. “A set of principles, etc.; a scheme, method.” An example is “The set of correlated principles, ideas or statements belonging to some department of knowledge or belief.” Here a “set of correlated principles” can mean a set of *functions*. This creates the strange situation that *the word system is used for functor as well as for functions*.

Now let us see how one famous biologist, L. von Bertalanffy, defines the word “system” in connection with his field:

Every organism represents a system by which term we mean: a complex of elements in mutual interaction....Thus the characteristics of life are characteristics of a system arising from, and associated with, the organization of materials and processes...¹³¹

It is obvious that by calling an organism a system he uses the word *system* in the first meaning of a *functor*.

This writer has developed a General Systems Theory on this basis. He correctly observed that many functors as a whole function in a way, different from their isolated constituents. A collection of water molecules is liquid at room temperature while oxygen and hydrogen which make up water are gases. So in such cases:

...the actual whole shows properties that are absent from its isolated parts.¹³²

He often loses sight of this idea of a “whole” in his definition of a system later on however:

“A ‘system’ can be defined as a complex of elements standing in interaction.”¹³³

Gone is the requirement of “things connected so as to form a unity...” In his earlier definition he still talked about living things as a *unity*, a “whole.” The various interacting elements in our bowl of soup certainly form a “complex” whose elements “stand in interaction.” So it too comes under Bertalanffy’s definition of a system.

This new interpretation makes the entire cosmos with every living and non-living thing in it into one vast system. For every particle in the universe “stands in interaction” with every other particle. All together they form one vast “complex.” This is true even when the forces at play between particles are galaxies apart and can not be measured.

This different use of the word “system” makes it useless for distinguishing between living and non-living beings. If together they form one huge system under the new definition, they are no longer separate systems. This soon gets him in trouble.

On the previous page v. Bertalanffy writes:

“Biology is the study of larger organisms, physics that of smaller ones.”

So almost imperceptibly he slides over the gap he must fill in his reasoning: the difference between living and non-living.

1. On page 12 he had stated that “the characteristics of life are those of a system” and treats it as if life were something special.

2. On page 198 he calls living things and molecules organisms in the same breath. Physicists study small “organisms,” biologists larger ones.

3. On page 199 he turns the whole universe into a system.

Thus he casually presents us with the information that there is no difference between living and non-living things. They are all systems or organisms, merely different in size. And together they form the largest system of all.

If everything is a system, we can not answer the question: “what is a system?” But that was exactly the question under investigation.

This type of careless use of words does not help us in our enquiry. It simply destroys the whole sequence and meaning of the argument.

We are not playing a game with words. We are searching for scientific truth. We reject this ambiguous use of the word “system.” And for that reason we must dismiss the arguments which he bases on it later on. He has made them also logically invalid and therefore scientifically worthless. We will therefore look elsewhere in order to settle our doubts.

e. Continuing confusion

Another well known writer, Arthur Koestler, followed up some of the ideas of v. Bertalanffy when he formulated his idea of the *holon*.

Koestler was struck by the fact that nothing in the cosmos is an “isolated whole.” Everything functions as a “sub-whole” of something else in one vast *hierarchy*. But each of these sub-wholes “enjoys a considerable degree of *autonomy* or self-government.” For this sub-whole he coined the phrase *holon*.¹³⁴

We saw earlier how v. Bertalanffy expanded the definition of the word system from “an organized or connected group of objects” to that of “any group of objects,” even if they display no organized connection. Now we see Koestler expanding the meaning of a holon or whole even further. He makes the word “system” as defined by the dictionary into something vastly different:

All complex structures and processes of a relatively stable character display hierarchic organization....¹³⁵

He applies this to:

...inanimate...systems, living organisms, social organizations, or patterns of behavior.¹³⁶

It even includes instinctive activities such as building a nest or weaving a web and acquired skills like playing chess, i.e. functions. Defined in this manner, a holon becomes a

“...self-regulating ‘open system’ governed by a set of fixed rules, which account for the holon’s coherence, stability and its specific pattern of structure and functions.”¹³⁷

Needless to say, the word holon, used in this ill-defined manner, adds nothing to our understanding. It does not define anything specific in the world of molecules, solutions and mixtures. It does not even distinguish between individual functors and the functions they display. This confusion of functor and its functions by scientists is very common, as we have seen. It is accurately reflected in the two conflicting definitions of the word system in the Oxford dictionary as we saw above.

We need words to express the difference between a bird, i.e. a functor, and its function of building a nest. Without them, our language has lost its power of communication. We can not conduct science or even live without a reasonable agreement on the meaning of words. Who can call the activity of building a nest a “self-regulating open system” and expect to be understood?

Without a doubt, we need a word that expresses the difference between a functor and its functions. We must be able to clearly express the functions of a random collection of unorganized particles. We should be able to define what is a mechanical system like a man-made machine with its nuts and bolts. And most certainly we need words to describe the order scientists have discovered in biology. It is necessary to end this age old confusion. So let us see whether anyone has shed some light into this linguistic darkness. Let us look for a way to express more clearly to others what we are looking at.

NOTES

126. M.D. Stafleu, *Time and again* (Toronto: Wedge publ. Found. and Bloemfontein: Sacum Beperk, 1980).
127. *ibid.*, p. 153.
128. *ibid.*, p. 210.
129. *ibid.*, p. 211.
130. *ibid.*, p. 130.
131. Ludwig von Bertalanffy, *Problems of Life* (New York: Harper Torchbooks, Harper Brothers, 1952), p. 12.
132. *ibid.*, p. 130.
133. *ibid.*, p. 199.
134. Arthur Koestler, *Janus* (London: Hutchinson, 1978), p. 27ff.
135. *ibid.*, p.
136. *ibid.*, p.
137. *ibid.*, p. 293.

The Captain And His Captive Oarsmen

a. The captor and his captives – the theory of encapsis

We learned from Stafleu that when physical particles interact they can:

1. lose their identity;
2. retain their individuality and independence in “random” interaction;
3. form a new functor with other particles.

We will confine our investigation now to the third type of event. In this process the particles lose their independence; they are no longer free to interact with other functors at random. However, *they do not lose their own individual existence*. A nucleus and electron join to form an atom; atoms join to form a molecule; and none of the composing particles lose their individual existence.

Today scientists no longer doubt the continued individual existence of the atoms inside of molecules. Chemists have established the *structure* of many complex molecules with their captive particles, as well as their physico-chemical *functions*. A few remarks about their structure must be made first.

Herman Dooyeweerd examined the various theories that tried to account for the structure of individual functors like atoms and molecules in the twenties and thirties. He could not accept the mechanistic and atomistic views held by many biologists at that time. He believed that they ignored the new findings of quantum physics as they affect the relation between structure and functions in physical and living functors.

He felt that the mechanistic theories about how chemical structures can cause life-phenomena were inadequate to explain what happens. So he set out:

...on a laborious investigation of *empirical* states of affairs as established by science.¹³⁸

And he summarized his conclusions in the *Theory of Encapsis* in his N.C.III, p. 695ff.

He started with an examination of the structure of a simple molecule like that of water. At that time the theory that the hydrogen and oxygen atoms in a water molecule retain their individuality as real atoms was still disputed. He postulated that H and O atoms each have their own specific physical structure and display physical and chemical functions related to this structure. These atoms are subjected to their own specific (idios¹⁴⁰) laws (nomos¹⁴¹). I replaced the cumbersome term “individuality structure” which his translator used to indicate this with “idionomy.” See N.C. III 1, p. 79 for its definition.

When O and H atoms combine in a chemical bond, the new compound water shows a new structural form and a new idionomy. Water is a liquid at room temperature whereas hydrogen and oxygen are gases. They display very different functions.

The nuclei of the atoms of H and O are “captives” inside of the water molecule. Dooyeweerd said that these constituents “are ‘encaptically’ bound in the water molecule without becoming ‘parts’ of water.”¹⁴² Their internal idionomy remains that of H and O atoms and is not replaced by that of water. They can revert to their original independence at any time. In the case of heavier elements, most electrons even remain with the nucleus when the atom enters a chemical bond. They too become “captives.”

In physics every composite or “encaptic” functor displays a typical form. It also shows the typical laws that govern its functions: its idionomy. But in many cases we find it difficult if not impossible to draw important conclusions about functions from the structural form we see.

The idionomy of things however gives us the data we need for knowing what we are dealing with. We know the difference between helium and sodium from the different functions they display. They are governed by a different idionomy. This is the case for all atoms, molecules and crystals. And as soon as its idionomy is destroyed, such a functor ceases to exist and vice versa.¹⁴³ It is the task of the scientist to establish the form of functors and to formulate their laws of function, to find their idionomy. Is there anything else he can do? We will return to this interesting question.

When we investigate a physical entity, we must first have it available for observation. The individual thing furnishes us with the data from which we can conclude as to its structural form and idionomy. *We need to examine functors before we can find their functions.* And from those functions we formulate the idionomy that characterizes the individuals which belong to that type. This idionomy “has the character of a law.”¹⁴⁴

Dooyeweerd emphasized almost fifty years ago that an individual functor exists only as long as is determined by its idionomy.¹⁴⁵

This time span varies greatly: from a fraction of a second for some very labile chemical compounds to incalculable ages for some stable atoms.

There is an infinite variety in the types of composite physical functors. Yet they have one thing in common during the time span of their existence. Each individual representative forms a unity with its very own structure and functions, its own idionomy. It functions as a separate and unique SYSTEM, an “organized or connected group of (encaptic) objects....moving about one another in space under some particular dynamical law.” In the true sense formulated by the Oxford dictionary in its first meaning, each encaptic functor is a *system*. It is a unity functioning “under the laws” of its “particular” type, under its own idionomy. So only experimentally given states of affairs gave rise to THE THEORY OF ENCAPSIS.

b. The Captain runs his galley

About forty years ago, Herman Dooyeweerd applied his theory of encapsis to the living organism. After analyzing atoms and molecules he turned to the simplest known form of an individual living being, the one-celled organism. He published the results in *Philosophia Reformata* in 1950, much delayed by the war. This article was translated into English and formed the last chapter in *A New Critique of Theoretical Thought*, Vol. III, p. 694-780.

His conception of the cell as an encaptic functor appears to be as valid today as it was then. Hence I will present a brief summary of his views and follow this up with an application based on the current literature on biology. His analysis of the cell began on p. 714 of the book mentioned.

Dooyeweerd's analysis

The living cell is the smallest viable living unit. About viruses not enough was known at that time to evaluate them in this context.

From all available evidence, he concluded that a cell is not an aggregate. Its atoms and molecules do not move at random. The cell as a whole restricts their functions and imposes its own “rules” on them. The cell is an individual whole with its own idionomy.

A cell is a functor and its idionomy is the expression of all laws, set for its functions.¹⁴⁶ As a functor the cell displays a new set of functions: birth, growth, metabolism, maturation, propagation, life span, disease, senescence and death. None of these functions can be seen in non-living things. They are all functions displayed by living functors. And when we experience a functor which displays these functions, this mode of being, we know that we experience a new mode, a new aspect of real things. Dooyeweerd called this the *biotic aspect*.

The biotic aspect does not exist by itself. It does not make things alive, no

more than that the aspect of energy makes molecules into real physical functors. To claim that would amount to making a functor out of abstracted functions, the old error of abstract animism. It is the other way around. We do not create the distinction between non-living and living. We merely *notice* and *describe* it. This difference is part of the framework in which we experience reality. *It is given to us.*

Dooyeweerd stressed that the cell contains no living molecules. It continually absorbs and restructures molecules and ejects others in the process of metabolism. Through all this change it retains its individuality, its basic structure or anatomy and its idionomy.

Another remarkable difference with non-living things is the cell's centered structure.¹⁴⁷ Many of its functions seem to arise from the nucleus. In all its functions the centered structure of a cell is fundamentally different from all functors of a merely physical nature such as molecules or crystals. Even the most complex molecules in a cell lack this centered property.

The whole cell is involved in the formation of its various parts or organs such as the nucleus, centrosome and all kinds of alveolar structures.¹⁴⁸ This has been confirmed since by the discovery of all the various organelles we described in Chapter V. Each type of cell has its own specific anatomy and idionomy, just like any other individual functor in creation.

The cell is an encaptic functor that directs all its constituents. That includes enzymes and organizers that induce growth. They are mere inanimate molecules, captives of their "captor."

When we kill a cell, its idionomy is gone and there no longer is a captor to hold its constituents captive. Their chemical functions are no longer restricted and directed by the encaptic functor. As long as the cell lives, the chemical functions of its captive physical functors really belong to the idionomy of the living cell. The cell initiates, directs and concludes them.

The cell contains only non-living functors.¹⁴⁹ It can not alter the idionomy of its physical constituents. It can not change the laws of physics and chemistry. The physical aspect of its particles remains the same. The organism merely directs, initiates and concludes all chemical happenings.

The cell is alive in all its functions, as directed by its biotic idionomy, the body of laws that govern it. And it controls all activity of its captives like the pirate captain used to control the activities of the oarsmen in his galley.

NOTES

138. Herman Dooyeweerd, *N.C.*, vol. 3, p. 694.
139. *ibid.*, vol. 3, p. 79.
140. From the Greek ιδιος
141. From the Greek νομος
142. *ibid.*, vol. 3, p. 699.
143. H. Dooyeweerd, *N.C.*, vol. 3, p. 79ff.
144. *ibid.*, p. 97.
145. *ibid.*, p. 704.
146. *ibid.*, p. 717.
147. *ibid.*, p. 720.
148. *ibid.*, p. 720.
149. *ibid.*, p. 768.

Life Is Very Special

a. The emerging prowlers of the sea

In chapter XII, c we found that in a bowl of soup with its many chemical reactions going on, only new molecules were formed. Each new molecule remains a single particle with its very typical idionomy. We have no evidence that groups of molecules combine into systems with functions that are governed by more than ordinary physical laws.

The theory of abiogenesis postulates that molecules can do this. The fact that scientists have not produced such a system yet does not deter them. What we can't do today, we may be able to pull off tomorrow, they say.

We agree that this is how all experimental work is done. We learn how to do new things. The question under scrutiny now is whether we have good reasons to expect that we will produce such molecular systems in the future. The question is whether this is *possible*.

Physicists, including the practitioners of astronomy, hold that the laws of nature allow us both prediction and postdiction:

We can just as well predict the position of a planet at a certain time in the future, as postdict it at a certain time in the past.¹⁵⁰

The laws of physics, such as that of gravity, are universal: they hold *always* and *everywhere*¹⁵¹

Because this is held true, there can be such a thing as science.¹⁵² Because of the conviction that things worked in the past the same way they do today, astronomers feel comfortable with postdiction. Stars whose light we see today was emitted millions of light years ago, they say. The laws for the transmission of light have always been the same.

Physicists believe that the law on the conservation of energy is such a universal law. And the laws that spell out how this energy is distributed over physical particles have always been the same. As we saw, this energy is distributed over all particles of one type in the same random fashion. The

Lord treats all particles of the same type in the same way. He shows no favoritism for molecules.

The theory of abiogenesis claims the opposite: In the distant past some physical particles ceased to receive their energy at random. They received it from other particles according to new laws. Some molecules no longer handed out energy at random to the first comer, as they had always done. Now they began to hand it out with discrimination.

Now all particles no longer got an equal break. Some were privileged and received energy in *order* to do things which the rest could not do. The laws of physics changed, they became selective. Democracy became elitism. Some molecules learned clever tricks.

The laws of random interaction had ruled the world of particles everywhere from the beginning. Now these laws were no longer universal. Exceptions began to show up. Some molecules “learned” to *select* certain other particles. They began to direct their mutual interaction for a purpose: to make more of their clever little selves. From random roamers of the sea they became sharp-eyed prowlers with a purpose.

The result of all this was the appearance of a new *order* among particles in solution. It was an order in the service of new “wholes.” To achieve this, such an ordering molecule began to *make* others captive and to put them together in such a way that jointly they formed a replica of the particle doing the ordering. *Random interaction changed into orderly direction for a purpose.*

There is one small problem with this manner of reasoning. All physicists, including Monod, Dillon, Oparin and Sagan, agree that the laws of physics are universal. They have always been the same for all similar particles. But at the same time they say that these laws have not always been the same. The laws changed for a time in order to make abiogenesis possible. With that accomplished, they turned back to normal. But this cannot be. An explanation must be *effective*:

...it is not acceptable if an explanation can explain anything, i.e. it can explain a statement as well as its negation.¹⁵³

An abiogeneticist must maintain that the laws of physics never changed. And at the same time he has to say that once upon a time (in a split-second or over a period of billions of years, depending on one’s personal preference) they changed. But only temporarily. This explanation is not “effective.”

Few physicists will deny that the law of gravity is universal, that it has always governed the interaction of planets. We can read about one exception. That is the time when Joshua commanded the sun to stand still in order to accommodate him in his pursuit of his enemies.

The abiogeneticists are the modern Joshuas of the primeval oceans. They

suspend the laws of random interaction between physical particles in order to accommodate some large molecules in their pursuit of a prey, suitable for their self-replication. Compared to Joshua, however these scientists are quite handicapped. They were not there at the time of the event they tell us about as he was.

There can be no doubt about the magnitude of the feat claimed for those molecules in the theory. Their interaction was in blatant violation of the laws of physics as we know them. According to our present knowledge, that is not an acceptable explanation.

In “normal” science, a researcher is expected to revise or scrap his theory if every experiment proves it to be false. We know that chemical interaction of atoms and molecules *always* leads to old or new atoms and molecules *and nothing else*. In normal science the conclusion would now be drawn that this is a law of nature:

Interaction between physical particles never yields anything but molecules and atoms, i.e., other physical particles.

That means that *abiogenesis is not acceptable as a possible event*.

Abiogenesis therefore must be believed against all the scientific evidence at our disposal. I have no quarrel with this as a belief, although I do not share it. But I resent it when it is presented as a scientific theory. That is a downright misrepresentation of the facts. No molecule can ever turn into a clever prowling hunter.

b. The captives under the law

Now let us re-examine that simple living being, the bacterium *E. coli*, bearing in mind what we have found so far. For a general description of its internal functions, we may refer our readers to the data given in Chapter VI, where we recounted many particulars from the findings of our biochemists.

The particles in our bacterium are governed by the same laws that rule all similar particles outside of it. But the cell restricts the scope of their interaction within its body. The cell limits the interaction of every captive molecule to functions that conform to its cellular idiom.

For instance, the amino acids that make up proteins do not enter and leave the protein molecule at random. That would destroy its structure and function. They remain where they are as long as the cell restricts their movement towards the outside. And when the cell is ready to get rid of the protein molecule, it lets enzymes destroy it and release the amino acids.

The cell can capture particles from the outside *selectively*. Some cells, e.g. our red blood corpuscles, contain a much higher concentration of potassium than the serum of the blood that surrounds them. Potassium does not come and go at random. It is “pulled” in against osmotic pressure. All cells can do

the same thing with nutrients they need. Our kidneys work on the same principle when excreting waste products from the bloodstream.

Our bacterium contains enzymes that accelerate specific chemical reactions up to one hundred thousand times at body temperature. And it *makes* these enzymes itself. In the same way it manufactures inhibitors and uses them to slow down or stop reactions when enough of their end-product has been made. In this way the cell oversees a strictly controlled market. It regulates the production of the goods needed for proper functioning of a healthy “economy” inside its territory.

Because each cell has a specific permanence in time, we *have the time* to investigate it. Each type, be it a bacterium, an amoeba or one of the million cells that work in a rhinoceros, has a certain average life span allotted to it. In organisms with many cells some, like our nerve cells, may last our entire life time. They do not reproduce after our infancy. E. coli divides into two new cells every twenty minutes. The embryo in some plant seeds can remain intact and viable for centuries. Seeds found in the tombs of Pharaohs have germinated after having been buried for hundreds of years.

And so we see that the functions are displayed by these functors for specific periods of time. They occur in a tightly controlled time schedule and sequence. Throughout its life time the organism is governed by the laws, set for all its functions. And inside its cells all captive particles are subjects under those laws.

c. Born to live

Birth. Each living being arises through division of parent cells either directly or via a complex process of sexual reproduction. In either case a new individual arises in a process ruled by the laws, the idionomy, of the parent cell(s). This process is incredibly complex. It is directed and ordered down to its most minute details at the molecular, atomic and perhaps even the sub-atomic level. And this ordering not only involves the aspects of number, space, motion and energy. Everything occurs **AT THE RIGHT TIME** and continues for a strictly regulated **PERIOD OF TIME**.

Growth. A cell grows by active and selective means through the process known as metabolism. It breaks down absorbed protein molecules into their amino acids and rebuilds them to suit its own needs for proteins. It does the same with fats and starches and smaller particles. And then it grows by building its body through a host of chemical processes which it directs along the pathways set by its own idionomy.

Timing. Some cells grow faster than others. Some live longer than others. The idionomy of the cell also controls its processes *in time*. People have no

idea how time affects physical functors and living functors. The reason of course is that time is not a functor and cannot “affect” anything. Anyone who says time “does” is a confessing abstract animist. We may talk of “built-in chemical clocks” but that is a poetic metaphor without scientific value. It explains nothing. Particles can oscillate at a certain frequency. We have no scientific grounds for saying that they can keep track of time and start up ordered growth.

Maturation. All one-celled and larger organisms eventually stop growing; they “mature.” This time-related process can be of an astonishing accuracy. Last year I divided a *Cattleya* orchid into three specimens. A year later each of these divisions opened its flowers on the same day. This time-regulatedness holds for all living individuals of a type. We can predict it within narrow boundaries.

The functions of physical particles are related to time in a totally different manner. For instance radioactive decay affects individual molecules in random fashion. Here we can only make predictions on the basis of laws that hold for *average* functions of the class. We cannot speak of “seasonal” decay. Nor do molecules grow into adulthood. There is no old and no young here.

Illness. A living organism can get sick. Even our *E. coli* has its enemies that prey on it and kill it: a virus can do this. Parasites are organisms that take essential molecules from others and absorb them to serve their own needs. The host may manage to replace the lost material and no great harm is done. Many organisms can repair damage. We don’t die of a flea bite. But in a massive invasion by rapidly multiplying parasites such as *B. tuberculosis*, the host may get very ill for lack of necessary material. That is what happens when the bacteriophage attacks *E. coli*.

Of course there are many other ways of getting ill. A lack of nourishing chemicals can inhibit the metabolism of our cell and make it sick. It starves. Poisonous chemicals can inhibit normal enzymatic activity and so hurt our bacterium through starvation. Anything that inhibits or stops the normal functions and so interferes with the idiom of the living organism will make it sick.

d. Condemned to die

Getting old is a strange phenomenon. As we have seen, Monod believes that the DNA molecule of an *E. coli* contains all the information it needs for every activity in its short life span. That must then include the information which sets off the process of getting old. Unfortunately, the word *information* is a mere metaphor which explains nothing.

As we know, before its twenty minutes are up, the bacterium gets so old that it has to double its DNA and must divide into two brand new individuals. How can inanimate molecules “feel” the progress of time and “know” when they have to start doubling up? How is the information about the ticking of the clock expressed in the sequence of our four amino acids in the DNA ladder? We know nothing of the kind.

We know that *E. coli* rearranges its 3,000,000 odd pairs of nucleotides before division. But we have no reason to believe that the revolutions of the earth around the sun can be held responsible for this event. We have no scientific data on these matters and no idea on how to get them either. We can not even formulate a theory on how such things relate in time.

We know something about WHAT occurs and a few things about HOW it happens. But we know nothing of the WHY of getting old. And what holds for a bacterium is equally true for all living beings. We can discover the idiomony of a functor. We can not investigate the origin of this idiomony.

Every living organism must die as sure as it was born. Its existence as an individual comes to an end. Whether it simply divides or propagates sexually depends on its idiomony. We will ignore horticultural division, which is merely a utilization by man of the idiomony of certain organisms which can reproduce asexually.

Some multicellular organisms can live for millennia. The bristlecone pine seems to live as long as 3,000 years. We will limit our enquiry to the phenomenon itself. Every living thing has a maximum life span as part of its idiomony. It must obey the laws of dying as certainly as those of living.

Each type of organism has a time order for its functions from birth to death. From *E. coli* to sequoia tree, this order is the same: after birth come growth, maturation, senescence and death. *That order never varies.* Such is the idiomony of living things and of them only. No other functors such as molecules display it. Only the duration of the individual varies and is typical for different species. But for all death is the end.

No scientist has ever defined death satisfactorily. We see that the various life-functions cease. The order imposed by the organism’s idiomony disappears. The encaptic functors suddenly are released from their captivity. They resume their random existence of physical functors without the restrictions imposed on them by the organism.

As scientists we can say little about death. We can observe the changes in the physical events AFTER the thing that once lived has died. We see the sudden change in functions of molecules when released from their bondage in the encaptic functor. We know the difference between alive and dead through common sense. We are unable to analyze it scientifically. This need not worry us. There are so many other things we can not understand. But we do know that all living things are condemned to die.

e. This wonderful thing that is life

Once more we find ourselves standing before a borderline we can not erase. It is nothing new. Let us recall earlier borderlines that halted our thinking.

We could not move in our thought from points that take up no space to the concept of space in logical continuity. There was a borderline before which we came to a halt.

We could not think of something that moves, that changes its location, without “taking time.” The starting point “in space” and the endpoint had to exist “at the same time” if we were to experience the concept of distance, of spatial extension. But now we have this distance over which the moving body must travel “in space.” We could not think of that moving body without a continuous “flow of time.” That constituted another borderline for our thought.

It was the same with the aspect of physical energy. Motion is an abstract aspect. It never yields physical functors which display energetic interaction. This makes us aware of another mysterious borderline. It separates the world of concepts from that of real physical things.

And now we see living things with all the functions we noted. Gone are the random manner in which the aspects of number, space, motion and energy apply to the laws that govern physical functors. In its stead we have nothing but order, lawful behaviour, controlled in an inscrutable manner. This makes us aware of another border. It is even more mysterious than the previous one.

From their random functions we learned to recognize physical functors for what they are. A theory teaching that they can assemble themselves violates these very laws that enable us to examine and distinguish such functors. Even atoms join into crystals under conditions imposed from outside.

A marvelous order characterizes living beings. From this ordered way of functioning we learned to recognize and distinguish them. We did not dream up an artificial boundary between inanimate and alive. It is a distinction we notice with our common sense.

We formulated the laws of physics and life after we observed the regularities in each group of functors. We abstracted the concepts of the physical aspect and the biotic aspect from existing functors. It is *impossible* to reverse the order. We cannot invent an aspect, dream up a functor that would display it and then formulate the laws that would govern its functions. That is not how we got the idea of the radical difference between non-living and alive. *It is a distinction we notice with our common sense.*

The significance of this distinction is deepened by our scientific enquiry. But that is all scientific investigation can do. The difference was there before we could notice it. And no matter how we try to reduce the one to the other, reality will not change. The difference will not go away. A borderline remains which we cannot cross in our thinking when we examine inanimate and living things *as they are given to us*. That is just the way they exist.

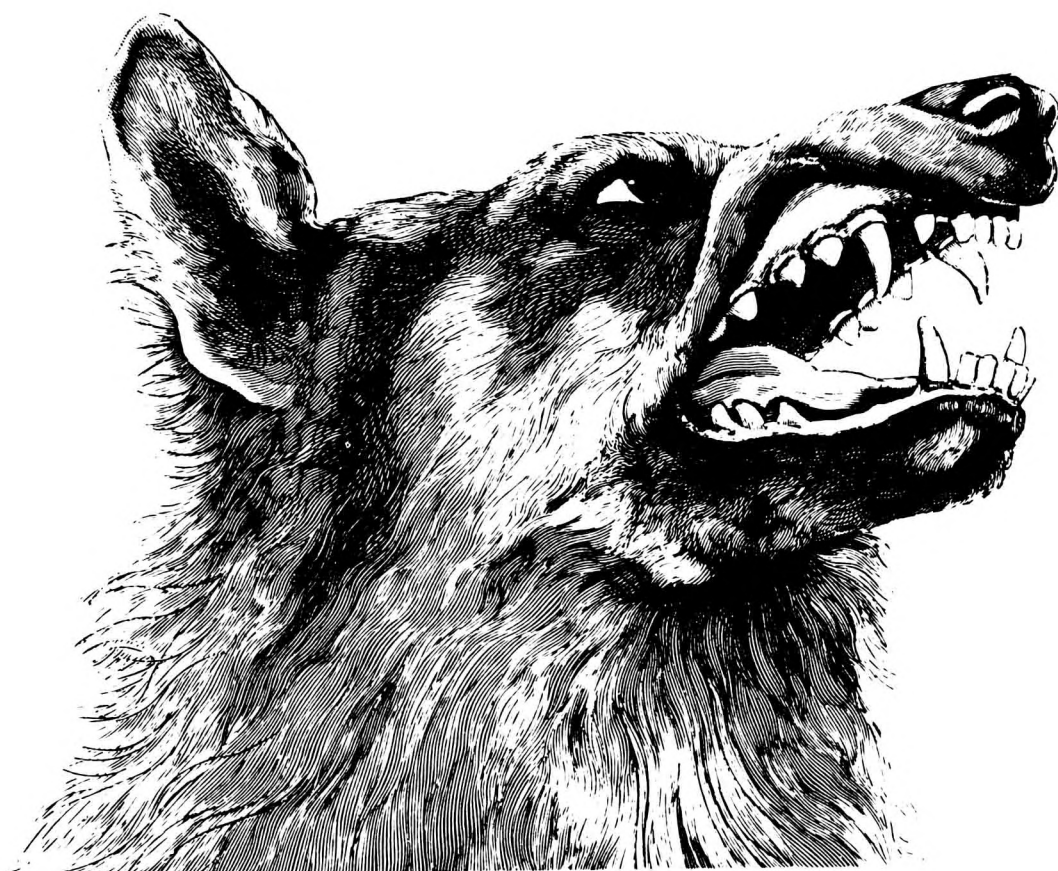
After all that scientists have said, we are not closer to the secret of origins. We can only marvel at the wonderful gift that is life. Was Dooyeweerd saying too much when he concluded from what he learned from biologists that *life is a separate and irreducible aspect*?

NOTES

150. M.D. Staflue in *Philosophia Reformata*, vol. 46, (1981), p. 174.
151. Carl Sagan, *Cosmos* (New York: Random House, 1980), p. 69.
152. *ibid.*, p. 46.
153. M.D. Staflue in *Phil. Reform.*, vol. 46, p. 176.

Part Five

Humanism in Crisis and Defeat



The Battle Of The Heathen

Chapter XV

a. *The seeds of Revolution*

In his book: *The Structure of Scientific Revolutions*, Thomas S. Kuhn discusses how scientists like to use models, which he calls *paradigms*.¹⁵⁴ He observes that during normal investigation there is usually agreement underlying most research. But there are always findings that conflict with current theory. And if too many anomalies occur, the theory becomes questionable. Their discoverers will try to formulate a new version of the theory in an attempt to save the overall paradigm. Kuhn shows with many examples such as that of Copernicus that a “proliferation of versions of a theory” is often a sign of an impending “crisis.”¹⁵⁵

Since Kuhn wrote this book, his concept of a paradigm has been attacked and defended with great fervor. For instance Lakatos pointed out that a lot more than some anomalies are needed to abandon such a paradigm.

In a new book of 1977 Kuhn changed his definition of the paradigm. He writes that:

A paradigm is what the members of a scientific community, and they alone, share.¹⁵⁶ And a *scientific community* consists of “the practitioners of a scientific specialty.”¹⁵⁷

This seems to imply that all the scientists who practise a specialty usually share the same beliefs. That is not true as we will demonstrate in the next section. And “what they share” he no longer calls a paradigm but a *disciplinary matrix*. This matrix consists of three main components:

1. “Symbolic generalization,” such as statements made in mathematical form.

2. “Models.” These can be preferred analogies. For instance we can describe gas molecules as microscopic billiard balls in random motion. But a much deeper, even a metaphysical commitment may be attached to models. For an example he gives the statement:

....all perceptible phenomena are due to the motion and interaction of qualitatively neutral atoms in the void.¹⁵⁸

That goes down deep. It amounts to the religious creed of a materialist.

3. "Exemplars," concrete problem solutions.

It is clear from this redefinition that the concept of a paradigm can mean very different things. It can be the harmless use of analogies and metaphors, which are useful as an educational aid. But it can also involve a scientist's deepest convictions of a religious nature. In the example quoted above Kuhn himself describes such a commitment: that of a mechanistic materialist.

In its new definition the word paradigm obviously does not sharply distinguish between simple analogy, scientific theory and religious belief. There is so much opportunity for disagreement on the most basic commitments in a discipline as to make the concept of paradigm useless. For that reason we will try to avoid it from now on. Instead, we will talk of "deep commitment" or religious belief, and of scientific theory. And we will try to distinguish between harmless analogies and animistic personifications.

In the meantime we recognize the merits of many distinctions and expressions introduced by Kuhn. He has sharply brought out that the way scientists theorize is strongly influenced by current beliefs in their community. In *The essential tension* he talks about this in terms of *formalism*.¹⁵⁹ Some object to this idea as in conflict with the "objectivity" in science. They have called this commitment to belief underlying the theorizing of a scientific community: "mob-psychology."¹⁶⁰

A new theory which conflicts in a drastic manner with an existing one and overturns cherished beliefs can cause a change in the way we look at science in general. That can take on crisis proportions for some scientists, especially if it threatens their religious beliefs. Then they begin to speak of a scientific revolution.

It is our aim to demonstrate that the scientific community has entered such a period of crisis. A new theory has arisen that can cause a drastic change in our thinking. It is the theory of *encapsis*. And with the advent of such a new theory, a revolution may be in the offing.

Materialism has been prevalent for a long time. It was widely accepted for explaining many and varied phenomena. Popper claims that it has led to great discoveries in the natural sciences. But these discoveries have been limited to knowledge of the *physical aspect* of inanimate and living functors.

Popper himself has had to admit that as a philosophy, reduction of biological phenomena to those of physics has been a failure.¹⁶¹

Popper does not distinguish modal aspects. But he concludes from the evidence that the concepts of physical energy and life are mutually

irreducible. That supports Dooyeweerd's thesis about the irreducibility of the modal aspects. We will come back to that.

As a belief, materialism has become tattered around the edges. Too many problems have arisen. That is particularly true for its application to the question of the physical origin of life: the theory of abiogenesis. Without exception, all research has failed to confirm its major premises. Every test yielded an "anomaly." And no revision of the theory has been confirmed by experiments. That is a sign that a crisis is imminent. In fact, it is already here.

The public at large does not realize this yet. They still hear of the wonderful certainty of the materialistic faith. Everything can be explained with it. But as we will show later on, many scientists know better. They are quite aware of the problems. But, as Lakatos points out, the scientific community needs a lot of prodding before they abandon their commitment to a major body of theories. Before they start a scientific revolution, they must be offered a new theory that looks good enough to be considered as an alternative.

We can expect materialists to fight desperately in defense of their faith. They need the confirmation of abiogenesis as a scientific theory. Therefore we will first review some of the problems that are recognized by major scientists and that rock this theory on its foundations. For they contain the seeds of the coming revolution.

b. Cosmic Animism: the problem with dialectics

J. Monod provides a typical example of how a deep commitment can underly our theorizing. He attacks all kinds of such beliefs in others, such as the vitalists. But his main preoccupation is the belief of the dialecticians.

Monod sees the philosophy of Hegel as a "colossal and ponderous monument," burdened by "cosmic animism." He defines animism as a:

...projection into inanimate nature of man's awareness of the...functioning of his own nervous system.¹⁶²

He accuses Hegel of ascribing a human spirit to inanimate functors in nature and openly calls it "cosmic" animism. We could not agree more. In our terminology it is "concrete" animism. He elaborates further on this. It is:

...the hypothesis that natural phenomena can and must be explained in the same manner, by the same 'laws,' as subjective human activity, conscious and purposive.¹⁶³

Primitive animists populated nature with mythological figures and endowed them with a conscious "anima." Thus Monod's definition of animism is the same here as that of our concrete animism.

Hegel postulated that the most general laws governing the universe are dialectical. That, says Monod, is all right within a mental construction. But Hegel's pupils Marx, Engels and Oparin turn things upside down. They project this manner of dialectical thinking into the subjective laws of nature. And that, he says:

...is to effect the *animist* projection in the most blatant manner and with all its consequences, the scrapping of the postulate of objectivity being the first. (e.a.)¹⁶⁴

He takes an example given by Engels in his *Dialectics of Nature* about the grain of barley, which, when sown, dies, is "negated." After it has grown, ripened and died again, this "negation" results in barley again, "not as a single unit, but ten-, twenty-, or hundred fold. This is an "epistemological disaster."¹⁶⁵ It is not legitimate scientific reasoning because:

...to make dialectical contradiction the 'fundamental law' of all movement, all evolution, is...to try to systematize a subjective interpretation of nature....This is 'animist projection' again.¹⁶⁶

Clearly "dialectical contradiction" is an abstract concept. Hence Monod now attacks Engels for his "animist projection." Again, we heartily agree and call it "abstract" animism.

Farley gives a number of examples of how "metaphysical" commitment, i.e. religious belief, can affect scientific theorizing. He relates how Engels rejected two great discoveries in the name of his dialectics: the second law of thermodynamics and the theory of natural selection (in spite of his admiration for Darwin). In the same way Lenin assailed the epistemology of Mach; and Lysenko rejected the genetic theory of Mendel as at odds with dialectical materialism.¹⁶⁷

These are all typical examples of the prejudices in a scientific community as Kuhn described. He wrote that the "cognitive apparatus" in such a community can tell us in advance

...about the way in which the group's members...identify the special formalism appropriate to a particular problem...¹⁶⁸

Hegel had abstracted human reason and elevated it as an independent spirit – abstract animism:

On the stage on which we are observing it – universal history – spirit displays itself in its most concrete reality...it exists *in* and *with itself*...spirit is a *self-contained existence*.¹⁶⁹ (e. in text).

Monod rejects such dialectics as an idealist theory, anthropomorphic, with:

...man and human thought...necessary end-products of a cosmic process.¹⁷⁰

Hence he does not accept Engels' and Oparin's emerging biological laws that pop up with the growing complexity of the motion of matter. He rejects this display of spirit, of Hegel's "universal history." He rejects the implicit predictability of these laws, projected into the origin of life:

In my view the biosphere is unpredictable for the very same reason – neither more nor less – than the particular configuration of the atoms constituting this pebble I have in my hand is predictable.¹⁷¹

Compared with his own "objective scientific approach" he feels that Oparin has a problem. Because of his dialectics, he is every bit as much an animist as were Hegel and Engels. We can agree with this assessment.

In *Time's Arrow and evolution* Harold Blum cautions against over-emphasizing the value of models, since we run the risk of taking the model for the real thing.¹⁷²

He examines the droplet models of Oparin and asks where they obtained the free energy needed to form the precursors of proteins. The energy providing systems must have arisen at the same time as the nucleic acids and proteins, because the one needs the other. "Just how this might have worked in a non-living system is...not clear."¹⁷³ In fact:

The riddle seems to be: *how, when no life existed, did substances come into being, which today are absolutely essential to living systems, yet which can only be formed by those systems?*¹⁷⁴(e. in text)

It is obvious that Blum senses that there is something drastically wrong with biological order arising out of random chaos. And he cannot accept the next step either – the appearance of natural selection – inside droplets of inanimate matter. Oparin taught that some of the complicated chemical compounds inside them succeeded in the struggle for existence:

The loose use of the term or the tacit introduction of the

concept (of natural selection) into this phase of the evolutionary process would seem to add confusion to our thoughts about the problem.¹⁷⁵

Blum knows that the concept of natural selection only applies to living things. He calls introducing it into the phase "when no life existed" a "loose use of the term." It merely confuses the issue.

Blum struggles with the problem we encountered in Chapter XII. We concluded there that the interaction between physical entities yields only physical systems, even in a bowl of soup. Blum as much as admits here that he knows this too. After all, Oparin's coacervate droplets are nothing more than mini-bowls of soup. So for him, just as for Monod, *the riddle remains*.

In *The Genetic Mechanism and the Origin of Life*, L.S. Dillon looks at all available experimental evidence around the problem. He rejects Oparin's droplets for the reason that enzymes, necessary for catalyzing proteins, have never been found to catalyze *themselves*. Enzymes can function anywhere, also in droplets, but:

...only in a mechanical fashion, for none of the products of the resulting energy is of any value...to the colloid particle.¹⁷⁶

None of the artificial systems produced, including the coacervate droplets, give any concrete evidence as to how organisms could have arisen. Thus Oparin's model is not considered useful. His droplets of soup remain sterile. *The riddle remains.*

It is interesting to hear Dillon say here that he rejects Oparin's model because it proposes something that has never been found to happen. The mechanical process yields nothing of any life-value to the particle. That thought did not occur to him when he let his own molecules *replicate themselves*. And that was the basis for *his* explanation on the origin of life as we saw earlier.

He may not see his own shortcomings, but he is not blind to those of others. And so we find the representatives of the mechanistic sect of materialism bogged down; unable to solve the riddle. But all three, Monod, Blum and Dillon, clearly see the problem of Oparin which results from his dialectics.

c. Here come the dialecticians

Clad in the impenetrable armour hammered together by Hegel and Engels, the dialectician is invincible. The self-contained, (i.e. divine) worldspirit, "universal history herself," guides his fight.

And so, brimming with confidence, Oparin rides into battle against those misguided heretics, the "mechanistic" materialists. These simpletons see life merely in terms of the laws of physics and chemistry. They leave no place for specifically biological laws. They see no qualitative difference between organisms and inorganic matter. Thus life does not really exist for them. This is indeed the consequence of consistent mechanistic materialism. We can agree with that.

In Chapter VI, c, we saw that mechanists indeed see the living organism as a chemical machine. (Monod). Oparin will not hear of that. Rather, over a long period of time there arose "original systems,"

...forms of organization which are peculiar to the living body...there is not even the remotest similarity between the origin of life and the assembly of a machine.¹⁷⁷

We are inclined to say: “Hear, hear.” Instead, he says:

...machines are...in origin not biological but higher, i.e. social forms of the motion of matter.¹⁷⁸

And he derides Schrödinger, a famous physicist, for his “machinistic” view:

Nevertheless, in his (Schrödinger’s) conclusion, he was forced to characterize life as ‘the finest masterpiece ever achieved along the lines of the Lord’s quantum mechanics,’ i.e., to put it plainly, he acknowledged the *divine origin* of life.¹⁷⁹

These foolish mechanists are in reality a masked variety of religious creationists. Obviously, such an absurdity Oparin does not deign worthy of further comment.

In his *Genetics and Evolutionary Development of Life* (1968), he writes:

The clearest expression of life (as a special form of the motion of matter) is found in the specific interaction of living systems – organisms – with the environment surrounding them, in dialectical unity of the living body and the conditions of its existence.¹⁸⁰

Notice how he quietly slides over the crucial problem when he introduces organisms as living “systems.” Perhaps he does not realize himself what he is doing. At least he gives us no warning. In any case, the mechanists cannot see his point, which he emphasizes once more:

Thus, when mechanists attempt to explain the inner adaptability of organisms by analogy to machines, they inevitably arrive at...the recognition of the divine origin of life.¹⁸¹

It is quite interesting to realize where this reasoning comes from. Oparin rejects the notion of the living thing as a machine because machines show a design. Only beings endowed with intelligence design machines. And he rejects the Creator. So how to solve the riddle?

Aristotle taught that “nothing arises out of nothing.” Every design arises from a designer, just as every effect arises from a cause. He and his teacher Plato were convinced that:

...all reality has to have a reason for existing.... Since they rejected the possibility that anything, even something self-existent, could simply “come to be” out of nothing, they held the self-existent to be eternal.¹⁸²

This “self-existent” is what they both held to be divine and called god. And this god was the first cause, who made the design of everything else.

Thomas Aquinas took over this abstract concept of design and used Aristotle's reasoning as one of his five proofs for the existence of God.¹⁸³

Thomas' fifth "proof" says that inanimate things act in such a way that they reach their goal. Since they cannot think, something else must direct them when they "strive for their goal." He uses the example of the arrow which is directed by the archer.

Dooyeweerd analyzed these "proofs" and concluded that the initial premise already contains the conclusion by implication. The premise that the arrow strives for its goal already implies the existence of the archer who made the arrow and chooses his target. The whole series of steps in this reasoning must therefore be rejected. It "begs the question" (*petitio principii*).

So this idea again contains the inevitable *petitio principii* that we laid bare in the other four "viae demonstrationis."¹⁸⁴

Dooyeweerd therefore rejected man's claim that he can prove that God exists as "uncritical."¹⁸⁵ No pot can prove there is a potter.

We have an ironic situation here. Oparin sounds like a good catholic when he follows the reasoning of Thomas. He accepts his method that leads to the proof of God's existence. He does not go all the way, however.

He does agree that machines which cannot think, carry out their function as demanded by their design. He buys the idea of the design *as applied to living beings*. From that it follows that they must have a designer. He does not object to the error, contained in the premise that living things can be *proven* to have a designer. He objects to viewing living things as machines because he does not like the idea of a designer. His major premise is that THERE IS NO GOD. For that reason there cannot be designs or machines.

Like Aristotle, Thomas, and many a Christian today, Oparin fails to see the false reasoning in the attempts to prove that God exists. He does not notice its begging of the question. Nor does he object to calling living things machines because they show a design. He simply refuses to believe that there is a God Who would have to do the designing. That is why he is not a mechanist. He rejects the notion of design.

Oparin wields a tremendous influence throughout the scientific world today. Many writers on the subject, also in the West, agree with him. Most of them do not know that he derived his wisdom from the dialectics of Engels. That makes this only that much more remarkable. But their ignorance in these matters is not unusual. In his book, *A History of Psychology*, E.A. Esper quotes S.A. Hyman who wrote in the *American Scholar*, 1960, 29, about his fellow psychologists as being:

...provincial, ignorant of the humanities, and possessed of 'an amazing toler-

ance and even respect' for 'necromancers' such as parapsychologists.¹⁸⁶

We saw that Monod and his mechanists see nothing but physical particles and their laws. He has a blind spot for the irreducibility of the life aspect. In order to save the situation, he resorts to both concrete and abstract animism.

Now we see that Oparin cannot overlook this life aspect with its special laws. But he tries to bridge the gap and let these laws "emerge." He too fails to see the modal aspects with their created irreducibility. And he gets into as much theoretical trouble as Monod. He resorts to circular reasoning and is just as much forced to resort to animism as Monod demonstrated so clearly.

The evidence presented thus far clearly shows that biologists are no more immune to shallow philosophical pontifications than Esper's psychologists. We found them particularly prone to falling for the religion of animism. They personify both concrete functors and abstract concepts. But in doing that they merely perpetuate the speculative mythology that has plagued science for over three thousand years.

Many scientists never even become aware of the animistic propositions that rule their discipline in so many ways. People like Oparin appear to be so "reasonable" and are so eloquent. *And they are so right in insisting that living beings are governed by very special laws.* It is therefore not surprising that the dialecticians have come and conquered on many a campus.

But both sects of materialism have utterly failed to solve the riddle. They have not even offered a semblance of a rational solution. They all lowered their discourse to irrational arguments of circularity and animistic thinking. That is why materialism is undergoing a serious crisis today.

NOTES

154. T.S. Kuhn, *Revolutions*, Chapters 1-5.

155. *ibid.*, Chapter 7.

156. T.S. Kuhn, *The essential tension*, p. 294.

157. *ibid.*, p. 296.

158. *ibid.*, p. 298.

159. *ibid.*, p. 301.

160. Imre Lakatos in I. Lakatos and Alan Musgrave, eds., *Criticism and the Growth of Knowledge* (Cambridge, Cambridge University Press, (1970) 1981), p. 178.

161. Karl Popper in F.J. Ayala and Theodosius Dobzhansky, eds., *Studies in the Philosophy of Biology* (London, Macmillan, 1974), p. 279.

162. Monod, *Chance*, p. 30.

163. *ibid.*, p. 30.

164. *ibid.*, p. 34.
165. *ibid.*, p. 39.
166. *ibid.*, p. 39.
167. J. Farley, *Controversy*, Chapter 9.
168. T.S. Kuhn, *The essential tension*, p. 301.
169. Georg F.W. Hegel, *Philosophy of History*, trans. J. Sibree in Robert M. Hutchings, ed., *Great Books of the Western World* (Chicago, London etc.: Encyclopedia Britannica, 1952), vol. 46, p. 160.
170. J. Monod, *Chance*, p. 41.
171. *ibid.*, p. 44.
172. Harold Blum, *Time's Arrow and Evolution* (New York: Harper & Bros. 1955), p. 6.
173. *ibid.*, p. 168.
174. *ibid.*, p. 170.
175. *ibid.*, p. 181.
176. Dillon, *Mechanism*, p. 63.
177. A.I. Oparin (1962), p. 31.
178. *ibid.*, p. 32.
179. Oparin (1962). p. 27.
180. A.I. Oparin, *Genesis and Evolutionary Development of Life* (New York: Academic Press Inc., 1968), p. 4.
181. *ibid.*, p. 6.
182. Roy Clouser, *What is Religion?*, Unpubl. mss.
183. H. Dooyeweerd in *Phil. Reform.*, vol. 17 (1952), p. 170ff. Trans. mine.
184. *ibid.*, p. 180.
185. *ibid.*, p. 181.
186. S.A. Hyman, *American Scholar* (1960, p. 29), quoted by E.A. Esper, *A History of Psychology*, footnote 28, p. 15.

The Failure Of The Foundation

Chapter XVI

a. Signs of failure

Kuhn tells us of the multiplying versions of the phlogiston theory in the eighteenth century. It stated that a hypothetical material was present in combustible material which would escape during burning. As a result, matter would get lighter. Yet, many reports began to come in that bodies such as metal gained weight on roasting. This seemed to contradict the phlogiston theory.

To avoid a failure of their theory, some scientists tried to modify it with a new version. They proposed that perhaps phlogiston had a negative weight. Or maybe fire particles entered the roasted body as phlogiston left it. The theory guided the undertaking of many experiments in order to confirm it. Instead, they stubbornly failed to confirm it. That, said Kuhn, was a sign of a crisis of the paradigm.¹⁸⁷ And in the end, it was replaced by the theory of oxydization.

Spontaneous generation of full-fledged young organisms had been accepted for centuries, as we have seen. But in the nineteenth century more and more species were found to arise from eggs, not mud. This threatened the theory and biologists tried to shore it up with all kinds of tests. Carl Rudolphi gave a list of over a thousand intestinal worms that were said to arise spontaneously. But as the tests to confirm this multiplied, the number of worms for which eggs were found also increased. This had the effect of refuting the theory which the tests were supposed to support. It began to show “signs of a crisis.” This process culminated with the experiments of Pasteur which laid spontaneous generation to rest for most scientists. In its place came the theory of “ovism.”

The theory of abiogenesis shows similar signs today. In Chapter X we quoted Miller and Orgel’s criteria for testing it. They advised that it must be:

1. consistent with astronomic and geological data,
2. plausible chemically, step by step,

3. repeatable in the laboratory.

Have these criteria helped to confirm our theory?

Ad 1. *Astronomers* could not be expected to be of much help. They do not investigate living things, nor their origin. Man has known the earth to be consistent with life long before astronomers arrived on the scene. It should therefore not surprise us that they did not produce anything to confirm or refute abiogenesis.

Geologists have produced a wealth of data about creatures that lived and died long ago. This shows that conditions have been consistent with life for a long time. But we don't need geology to convince us of that either. Man knew it before geologists showed up. They only examine fossilized remains of deceased organisms. They found nothing about their origin. So we may say that astronomy and geology have nothing to offer for evaluating abiogenesis.

Ad 2. All chemical experiments have confirmed the laws of physics and chemistry. But that is all they yielded. They have failed to give even the slightest indication as to what chemical steps our theory requires for life to begin. *We still don't have any data that indicate how to formulate the theory of abiogenesis.* Thus chemistry has not made it "plausible."

Ad 3. We have not repeated the required steps in the laboratory that could lead to life. The reason is simple. We haven't the foggiest notion what those steps could be. We have repeated some of the chemical steps which existing living things take to *stay alive*. We have found nothing which could have helped us understand how they came to life.

Just as in the case of spontaneous generation, the tests to confirm abiogenesis have multiplied. But in the same way and *without exception* they have stubbornly refused to confirm it. They have failed to show how inanimate molecules can organize themselves into living beings. The opposite is true. So none of the criteria mentioned have been met.

The negative outcome of the tests of Pasteur led scientists to drop the theory of spontaneous generation. The outcome of all tests done to confirm abiogenesis has been just as negative. As scientists we would expect this to lead to its rejection too. It did not.

The problem here is that it is no longer a matter of science. The *belief* in materialism requires the theory of abiogenesis. For that reason attempts are constantly made to shore it up. We will now look at some of these attempts, made in the face of its experimental failure.

b. The riddle to solve

In 1964 J. Keosian published *The Origin of Life*. With youthful exuberance he wrote:

...life originated only after organic compounds of a high degree of complexity

were available. Then macromolecules could...eventually evolve into living systems. The exact manner in which this occurred is *immaterial* to this argument. (e.a.)¹⁸⁸

I can propose that heat-resistant organisms exist on the surface of the sun: "Life originated there only when organic compounds with a high degree of heat resistance were available. How this happened is immaterial for this argument." This is perfectly consistent with logic. But does it have scientific value?

A theory is only scientific if it tries to explain something we know is real or suspect that it *possibly* can be real. As far as we know today, life requires conditions that cannot be met on the surface of the sun because of the laws of physics and biology. Therefore it is useless to propose this theory at this time. It remains science fiction.

The proponents of abiogenesis must still demonstrate to us that it is a scientific theory. They must prove to us that it is *possible* that life arose spontaneously from the inanimate material at least once. Otherwise it too will remain science fiction.

Exactly one hundred years before Keosian wrote the statement just quoted, Gilbert Child judged abiogenesis to be a necessary consequence of the doctrine of materialism. But he did admit that the *manner* in which life could have appeared from inanimate matter is *not* open to experimental proof. Have we any reason today to be as assertive on the origin of life as Keosian suggested? Is it open to proof today?

It is easy enough to say that life *must* have started that way. It may be a logical consequence of materialistic belief. But what scientific value can such a statement have if we lack all experimental confirmation? Let us see what modern scientists have to say.

S.W. Fox has been working on the solution of the problem by chemical means for years. In *The Origin of Life and Evolutionary Chemistry*, he writes:

The chicken-egg problem now needs to be rephrased...thermal experiments specify that...protoproteinoid (came) first...In the second stage the protonucleic acid was produced; it combined with basic preprotein...In the third stage, protein and nucleic acid were produced in approximate simultaneity. (e.a.)¹⁸⁹

It is obvious that the only words of scientific value in this quote are: "The chicken-egg problem now needs to be rephrased." And even that is a pseudo-problem. The rest is merely a series of statements for which Fox has no scientific experimental grounds. His religious stance on materialism forces him to make them, and he tries to bluff his way through an impasse of his own making. But bluff doesn't produce scientific proofs. The chicken-egg sequence remains.

In 1955 Harold Blum discussed the problem of how metabolism in “modern” organisms, which depends on functioning enzymes, could have started in non-living systems:

Just how this might have worked in a non-living system is of course not clear; but *this is a weakness shared by all hypotheses* having to do with the transition from non-living to living systems. (e.a.)¹⁹⁰

Blum openly admits that we have no scientific data to back up any hypothesis on the *how* of abiogenesis. This confirms what Dooyeweerd wrote in 1959, that such a hypothesis can in no way have a practical use in science.¹⁹¹ (see Ch. IV, b)

Of course we cannot explain *how* it happened until we have evidence *that* such a phenomenon did indeed happen. Some now say: “It did happen because through reasoning I can prove to you that it must have happened.” For that we must follow the circular reasoning of Aristotle, Thomas Aquinas and Oparin. But circular reasoning has no place in science. It is irrational.

Things are worse still. We have no evidence that the feats claimed by the theory of abiogenesis *could have* happened. Blum himself is aware of a riddle here as we saw in the previous chapter.¹⁹² And in his entire book he is unable to solve it.

J. Monod won the Nobel Prize in 1965 for his work on the replicating mechanism of genetic material. He was as convinced as Keosian was in 1964 that:

...it may be considered as *proven* that at a given moment in the earth’s history certain bodies of water *could* have contained in solution high concentrations of the essential components of the two classes of biological macro-molecules, nucleic acid and proteins.¹⁹³

Monod is not blind for the problem of manner which Keosian so casually brushed aside as “immaterial.” When discussing which came first, the DNA molecules or the proteins that translate the code contained in DNA, Monod writes:

The code is meaningless unless translated. The modern cell’s translating machinery consists of at least fifty macromolecular components, *which themselves are coded in DNA: the code cannot be translated otherwise than by products of translation*. It is the modern expression of *omne vivum ex ovo*. When and how did this circle become closed? It is exceedingly difficult to imagine. (e. in text.)...Here speculation must take over....*The riddle remains....*¹⁹⁴ (e.a.) The universe was not pregnant with life nor the biosphere with man. Our number came up in the Monte Carlo game.¹⁹⁵ (e.a.)

Monod is honest enough to admit that he cannot imagine *how* the riddle can be solved: “the riddle remains.”

He now wonders whether it *can* be solved. So at this point he leaves the scientific method of reasoning. Hence his: “here speculation must take over.” And indeed his statement about the universe is mere speculation. It has the same apodictic ending as the quote from Fox. Just like Fox, Monod resorts to bluff. He is so anxious to drive home his basic conviction that his conclusion has the ring of a declaration of faith. He certainly does not try to hide that his religious choice lies with materialism. But that does not solve the riddle.

We seem to have reached a point where we have three riddles to solve. We must show:

1. That life could *possibly* arise without a non-material cause.
 2. If confirmed, *that it did indeed happen*.
 3. Once we have shown this, we must find out *how* it occurred.
- This is a tall order. We have a three-pronged riddle.

c. Solving the Riddle

Humanistic scientists have for centuries tried to persuade everyone that science and religion can be separated. Anyone who introduces religious concepts is accused of ushering in the “supernatural.” He violates the basic rules of science. Monod calls it the abandoning of the postulate of objectivity. “Keep religion out of science” is the watchword.

We just noted that Monod is not immune to introducing religion into science. Let us examine this problem a bit closer. He gives an interesting discourse on the fortuitous happenings in the early oceans that led to life. And then he suddenly declares:

And so one may say that the same source of fortuitous perturbations, of ‘noise,’ which in a non-living (i.e. non-replicative) system would lead little by little to the disintegration of all structure, is the progenitor of evolution in the biosphere and accounts for its unrestricted liberty of creation, thanks to the replicative structure of DNA: that registry of chance, that tone-deaf conservatory where the noise is preserved along with the music.¹⁹⁶

This is beautiful language indeed and it clearly pleased its maker. But it is not scientific language. It expresses a religious commitment. DNA is a “tone-deaf conservatory ” that registers the perturbations of chance.

He declares chance to be the non-dependent agency on which all else depends for its existence. So he makes this abstract concept into something divine, endowed with the power to create. He worships it with animistic rev-

erence. And so he introduces religion into science again. But the solution of the scientific problem still escapes him. Can anyone give help?

Harold Blum believes he has the problem solved after all. The reason we cannot synthesize a living organism is simply our lack of time. Descartes had already mentioned this source of shortcomings in us mortals. It often limits our ability to understand the “most complex.” Blum ignores the question of whether inorganic matter *has* given birth to living things. He talks himself quickly past the question of *how* inorganic matter could have done so. He just walks around these hurdles and addresses the question of whether it could *possibly* have happened. He pronounces:

A good many of the properties of living organisms that appear unaccountable in terms of the inorganic world may stem from events that would be highly improbable within our modern frame of reference but which, when we take into account the lavish amount of time for them to have occurred in, becomes much less improbable.¹⁹⁷

This is of course loose talk. *Father Time* solves no problems, just as *Mother Nature* does not give birth to things. Time is not a functor that can make it probable for the properties of living organisms to appear. Time is not an agent that can make possible what clashes with the laws of physics and chemistry. Time is not even an agent. It is a concept. Blum raises the abstract concept of time to the position of a spiritual power to “create” the conditions necessary for life.

It is astonishing how many scientists are willing to trade scientific analysis for the primitive escape route of animism when they encounter something they don’t understand. When in doubt, make yourself an idol.

In Chapter IX, b we ran into a profound non-statement of Dillon. He wrote that:

Life...is the capacity of synthesizing proteins....

We noted there that an abstract concept like “capacity” cannot synthesize anything, no more than the concept “life.” He too practised abstract animism there. Now let us look at the conclusion of all his investigations:

...it becomes amply evident that living things are chemical entities, whose fundamental properties are describable in ordinary physico-chemical terms. Hence, to this degree *the prevailing mechanistic view of the organic world is firmly supported.* (e.a.)¹⁹⁸

This is a beautiful specimen of circular reasoning. Here is what he says:

1. Living things are chemical entities.
2. Their properties are describable in physico-chemical terms.
3. This firmly supports our viewing them as chemical mechanisms.

Stripped of redundant verbiage this means:

- 1) Living things are chemical entities.
- 2) They have chemical properties.
- 3) This firmly confirms the view that they are chemical entities.

It is legitimate to ask why such a celebrated scientist can come up with such a naive and unscientific specimen of circular reasoning. His first premise already contains the conclusion. It begs the question. It is “*petitio principii*.”

It may be said that this statement demonstrates a lack of formal training in logic. But that is not the main issue here: the problem goes much deeper. It makes us ask why so many of the best minds in the natural sciences think along the same illogical lines.

We have given a small sample of this type of thinking and could add scores of others. They all say the same thing:

- 1) First there was only inanimate matter on earth.
- 2) Today we observe many species of living beings.
- 3) These clearly arrived on the scene after the earth was formed.
- 4) Since *there is nothing but physical forces* that could have produced them, we *must* hold these forces responsible for their appearance.

If proposition 1 and 2 are true, No. 3 follows logically from them. Any bible-believer will agree: God created them after the earth. But proposition 4 is entirely unrelated to the other three. It is not based on observation. It too is based on a revelation: it is a “must,” whether you like it or not. It is revealed to us by the imagination of the Greeks and repeated over and over by modern materialists. But verbal repetition brings no proof to a proposition.

Like all forms of humanism, materialism is a religion. It cannot be proved but must be believed. And it needs the theory of abiogenesis in order to explain life’s origin. But since all experiments to make the theory credible have failed, both theory and religion are now in a crisis. How must a serious materialist respond to that?

NOTES

187. T.S. Kuhn, *Revolutions*, p. 71.
188. J. Keosian, *The Origin of Life* (New York: Reinhold, 1964) p. 106.
189. Sidney Fox, in Dose et. al. eds., *The Origin of Life and Evolutionary Chemistry* (New York, London: Plenum Press, 1974), p. 126/7. (Hereafter cited as *Chemistry*).
190. H. Blum, *Time's Arrow*, p. 168.
191. H. Dooyeweerd, *Phil. Reform.*, vol. 24, (1959) p. 157.
192. See quote referred to by footnote 174.
193. J. Monod, *Chance*, p. 141.
194. *ibid.*, p. 143/4.
195. *ibid.*, p. 146.
196. *ibid.*, p. 116/7.
197. H. Blum, *Time's Arrow*, p. 4.
198. L.S. Dillon, *Mechanism*, p. 426.

The Walls Are Crumbling

Chapter XVII

a. *The cracks are showing*

Things are beginning to look pretty grim for abiogenesis. The scientists who cling to humanism are divided into several different camps. We can distinguish these factions:

1. Those who *do believe* that abiogenesis is a valid theory and *can be proven*, given time and effort.

2. Those who hold that it *must be believed* to be a valid theory but admit that it *cannot be proven*.

3. Those who have begun to *doubt that the theory is valid* because of the conflicting evidence, but are disturbed, for they don't have an alternative. They don't know how to handle this problem.

4. Those who have *rejected it* because it clashes with everything else held to be true in science. It states the *unthinkable*. That puts them in a worse predicament. They are at a loss what to think since they too have no alternative. They are the "agnostics."

5. Those who *believe* in the theory and are convinced that it *has been proven*. They are the gullible.

We will examine the first three now. For them the building of the theory still stands, but cracks have begun to appear in its walls.

Ad. 1. The major thrust for the proposition of abiogenesis comes from those materialists who firmly believe that it can be proven. One major error some scientists make in their approach to the origin of life is to take the route that goes via its "essence." We have seen that Oparin, the major proponent of a dialectical version, takes that road. He believes that once we know what the essence of life "is," we will find out how it emerged. That implies that he sees life as a substance, a functor that you can find, once it has come out of the woodwork. As we have seen, this animistic starting point is doomed to failure by its own shortcomings. The mechanistic materialists also belong in this category. The young Keosian, Dillon, Fox, Monod and

many others simply draw the consequence of their religion and insist that an alternate theory to abiogenesis is not possible. Life *must* have begun that way. They believe that abiogenesis is a valid theory and that they will find the origin of life “some day.”

Ad. 2. Some scientists cling to materialism as a religion *in spite of* the scientific problems. They *must* believe in abiogenesis although they realize that it cannot be proven. At times people in the first category have doubts about their theory. They begin to waver between option 1 and 2.

We noted that Monod had a problem with his “riddle” as did others. Dillon too suffers from doubt. He wonders why all models available thus far have not helped him to prove the theory:

Indeed, the basic problem with all the models *thus far* advanced, looms so large that an enumeration of their other, minor failures is made meaningless.¹⁹⁹(e.a.)

Elsässer, a theoretical physicist, says:

...the dominance of mathematical method, so conspicuous in physics,...is not likely to be extended to biology at its more fundamental levels.²⁰⁰

In 1974 a report was published of the proceedings of a conference, held in Italy the preceding year. The topic was the problem arising from the attempts to reduce life’s phenomena to physico-chemical ones. Its title: *Studies in the Philosophy of Biology*. In the foreword F.J. Ayala examined some of the evidence available and concluded:

These considerations make it clear that the reduction of all or even most of biology to the physico-chemical sciences is *premature* at present.(e.a.)²⁰¹

June Goodfield recognized the success of investigations in the area of physics but added:

...successful methodology is one thing; dealing with one’s results quite another...One suspects that the difficulty lay...in specifying *why* the vital properties we observe are, in fact, a *consequence* of the structures and processes we have analyzed.²⁰²

She fails to see why “vital properties” are a consequence of physical findings. And this problem is not new either:

...the history of science abounds with examples where forms of explanation, successful in one field, have turned out to be *disastrous* when imported into another.(e.a.)²⁰³

All these people at least consider that it is dubious whether abiogenesis can be proven. Many know that is scientifically unthinkable.

Ad. 3. It is becoming clear to some materialists that abiogenesis may be a false theory after all. The reason: it clashes with everything else we hold to be true. Their problem is that they have no alternative. Still, some face the uncomfortable truth with courage.

The mature Keosian writes:

The point to be raised...is the *possible fallibility* of even universally held views. This oft-mentioned but rarely observed caution is particularly pertinent today when, with the rapid accumulation of data, views too soon attain the *stagnating status of dogmas*....(e.a.)²⁰⁴

He feels that our theorizing can readily get carried too far:

...any ‘universal’ definition of life conceptually strips any organism to which it is applied, of functions....Thus all living things are reduced by the limits of the definition from what they are recognizable to the same idealized entities from which the definition is derived. This is indeed *meaningless*.(e.a.)²⁰⁵

C. Ponnampereuma, in *The Origins of Life*, warns against adopting the theory of abiogenesis too lightly:

...a leap from morphology to function is fraught with *danger*....(e.a.)²⁰⁶

We must not let ourselves be carried away by our preconceived notions:

It is not easy to approach the study of origin in any field without *preconceived notions* about what one may likely find. The interpretation of data is the product of analytical insight exercised within a complex matrix of one’s *world view* and the prevalent scientific climate. And whether or not a scientific fact is “proved” depends in part upon the receptivity of the scientific community at a given time.²⁰⁷

This is beginning to sound like Kuhn’s definition of a scientific “paradigm.” He wrote that it is a belief which a scientific community shares and which colors their approach to scientific questions. To change such a paradigm requires something like a “conversion.”

Abiogenesis is one form of reductionism. It claims there are – or have been – transformations of inanimate functors into those that live. But this is now under effective attack. If one form of reductionism is shown to be impossible to verify, the general principle of reductionism may suffer the same fate. We will explore this interesting idea later on.

In any case, our third category of humanists realizes that abiogenesis *may* be a false theory. Yet, their faith demands it. They have no alternative. It must be hard to live in a building when one sees cracks beginning to show in the walls.

b. The wrecking crew is here

An increasing number of humanists of different denominations such as vitalists and materialists openly admit that abiogenesis is dead. And even more are inclined to believe this, although they refuse to say so in public. Some fear the reaction from their scientific community. They worry that they may be branded as being “unscientific.” They might be accused of entertaining thoughts of “supernatural forces,” of religious bias. So they keep quiet.

A large number of scientists look at all talk about origins with utter contempt. They feel that the question is irrelevant for their scientific work and refuse to even consider it. This is true for many physicists, chemists, biologists and physicians and others. In fact, I have rarely met a colleague in medicine who did not shrug his shoulders at the mention of abiogenesis. Many scientists hate pure speculation. The main reason why we hear nothing from them is the fact that they do not have a scientific rebuttal. Hence, they do not wish to write about it. But their number is growing under the surface.

We will now listen to some representatives of this category, number 4 in our previous section, who *did* show the courage of their conviction.

H. Skolimowski rejects the reduction of phenomena in the “biosphere,” i.e. of living things, and also of human functions, to mere molecular phenomena:

It would be trite and trivial to repeat that man is beyond the biosphere;...that molecular biology, even when supplemented by such concepts as ‘natural selection,’ does not even begin to explain such phenomena as human language....²⁰⁸

He feels it is “trite and trivial” to even keep talking about the reduction of man to mere biological or, worse, molecular phenomena.

And if it makes no sense to talk this way about how living beings function, how much less sense does it make to reduce their *origin* through such “explanation.”

He is even aware of normative “aspects” of man and objects to ignoring them and to their reduction:

...if the nature of things requires the use of normative categories for an adequate description of things, then it is our responsibility to use these categories....We sin intellectually by ignoring aspects of phenomena which partake in the process of life.²⁰⁹(e.a.)

Popper marvels at the progress made in biochemistry, but that deals with *how living beings stay alive only*, not with their *origin*:

...we can say that the undreamed of breakthrough in molecular biology has made the problem of the origin of life a greater riddle than it was before: we have acquired more and deeper problems.²¹⁰

He draws the ultimate conclusion of which a humanistic scientist is capable in this respect:

As a philosophy, reductionism is a failure.²¹¹

For him abiogenesis seems to be out for *philosophical* reasons.

Paul Weiss, a respected biologist, goes him one better. When Thorpe asked him whether the use of terms such as “coding” and “read-out” by protein molecules betrays a “veiled animism,” Weiss replied that this is not necessarily so. We can use metaphors. But when we use words like “dictate” or “organize” to indicate “action,” it is indeed animism:

...actions by whom? Spirits? Chemicals endowed with spirits?²¹²

Weiss knows concrete animism when he sees it. And he does not stop there. He refuses to indulge in abstract animism also. He does not confuse our scientific abstractions with real functors. Our abstractions remain just that: abstractions. When we rise above the aspects we have dissected in our analysis, we come back up again and are:

...in effect doing no more than restoring information content that had been lost on the way down....²¹³

He remarks that the physicists have “carved out...a partial aspect of the universe...” But we cannot reconstruct the organism from its physical properties since, when one “piece” is missing, “...all the others fall apart.”²¹⁴ In other words: reductionism is out. And so is abiogenesis. It is out on *religious* grounds. He rejects animism.

In *Origins of Life*, publishing the proceedings of the second ISSOL meeting in 1978, John Keosian goes as far as one can go in formulating the failure of abiogenesis. First, he rejects the spontaneous formation of a highly complex molecule such as a gene or an enzyme as

...an event of zero probability. An autocatalytic enzyme or a naked gene is alive only by the *author's proclamation*, and in the absence of organic compounds has not even a theoretical future.²¹⁵(e.a.)

And next he dismisses chemical evolution as an “end in itself.” It often

...represents contrived or ingenious laboratory syntheses which have no counterpart in abiotic organic synthesis in an acceptable range of probiotic conditions.²¹⁶

Keosian is aware of the underlying bias. These laboratory tests are often uncritical because:

...they support preconceived convictions.²¹⁷

Yet, he remains faithful to his own preconceived conviction, to his materialistic faith. What to do after he has come to this conclusion?

All present approaches to a solution of the problem of the origin of life are either *irrelevant* or lead into a blind alley. Herein lies the crisis.²¹⁸(e.a.)

To him, the failure of the theory of abiogenesis has brought on a crisis. He does not spell out why. But from his other writings we may deduce that it is his belief in materialism that is in danger.

As one way out of this crisis, he raises the possibility that a living organism arrived on earth from another celestial body. All that does of course is to push the problem out of sight and its solution out of mind. This is a “cop-out” and this too is irrelevant.

Every living thing has its physical aspect. It holds millions of molecules “captive” and controls their physical interactions. It “consists” of molecules and atoms. This however is a part-truth. But to say that it consists of “nothing but” physical particles is not a part-truth. Many respected scientists now are convinced that it is not true at all. Arthur Koestler has a word for the danger we face when offering part-truths:

Aberrations of the human mind are often due to the *obsessional pursuit of some part-truth*, treated as if it were the whole truth.²¹⁹

An honest scientist wants to avoid such aberrations.

So now we have found that quite a few distinguished scientists have openly broken with the theory of abiogenesis. They have succumbed under the weight of the evidence, produced by the experiments. They had no choice since the theory simply clashes with all known and accepted laws of physics and chemistry.

Dooyeweerd saw no way to accept the theory of abiogenesis because it cannot be proven and therefore has no scientific value. Of course, it also conflicted with his own belief in creation. But he knew that that would not cut any ice with humanistic scientists. Since he was convinced that it is impossible to prove the theory, however, he admitted that *from a scientific point of view* he had nothing to offer. He resorted to the “docta ignorantia” like Newton had done when asked what gravity is. And he felt that any honest scientist who had come to the same conclusion would have to do the same thing. His decision turned out to be a wise one.

Now we have to go beyond the position of Dooyeweerd. Along with some honest humanists, we have concluded that abiogenesis not only cannot be proven, but it is a false theory. It postulates the impossible.

To the loyal believers in materialism the statements of scientists who reject abiogenesis as a false theory amount to a betrayal of the faith. They

see these people as a wrecking crew that threatens to demolish the building they had so laboriously constructed. What have they done to try and salvage their cherished belief?

c. *The true believers*

For every scientist who believes abiogenesis as a theory is dead, there may be a million people who are convinced that it is a proven fact. This may surprise you. Yet it could be true, as a little asking around may show you. We can find such people among both scientists and “ordinary mortals.” How do they get this idea about abiogenesis?

Let us look at one scientist who probably has more influence on the opinion of his fellow scientists and the general public alike than anyone else today. His name is Carl Sagan.

In his book *Cosmos*, he tells us that he aimed his television series of the same name at popular audiences. He tried to “engage the heart as well as the mind.”²²⁰ At the time of writing in 1980, he estimated that some 140,000,000 people around the world had seen his show. And what does he tell them?

On page 30 he writes about “what happened here on Earth.” He repeats the scenario of Dillon, Monod and Oparin, without going into their controversies. The elements: storms, lightning, cosmic radiation, extreme heat and cold, volcanic eruptions, ultraviolet radiation and the like stirred the oceans which contained all kinds of organic matter. It was one vast bowl of soup. And then:

...one day, quite by accident, a molecule arose that was able to make crude copies of itself, using as building blocks other molecules in the soup.¹²¹

We can omit the rest of his tale, since I have already told it, gleaned from other sources. No doubt he got it from the same people. But it is interesting how he deals with conflicting opinions.

He describes how our ancestors “saw evidence of a Great Designer.”²²² But that was too simplistic. Darwin and Wallace *showed* that things happened in a different way. In fact, in our laboratories:

The stuff of life, it turns out, can very easily be made.²²³

He concedes that:

...life is certainly more than the amino acids...proteins...and nucleotides.²²⁴

But he has great expectations. He believes that experimental work on making the simplest organisms, viroids, may begin by the end of the century. He even had someone paint beautiful pictures of “imaginary but possible lifeforms in the atmosphere of a Jupiter-like planet.”²²⁵

Of course, our sage says nothing new. He repeats what you have heard from some of the great scientists who deal with inanimate matter and who belong to category no. 1. They all believe that abiogenesis is a valid theory that *can* be proven. He adds his bit by telling us that it is a *fact*, which puts him in the fifth group.

BUT....none of those quoted said that things actually happened according to their scenario. Only that it **MUST HAVE** happened that way. For them it is still a theory. And that is about the only thing that has a scientific ring in their story. Our great communicator Sagan however claims that they **DID HAPPEN** the way the others said they **MUST** have occurred.

Thus Sagan responded to the crisis in the theory of abiogenesis and its religious foundation in a peculiar manner. Either he has not read his scientific sources carefully as we would expect from such an eminent scholar, or else he could not face the truth of the scientific evidence and distorted it.

When someone believes something purely on hearsay and omits to check his data, we call him credulous. If he has ready access to such data, we are justified to call him negligent. When he deliberately distorts the facts we call him a fraud. And in any case, when he is not telling the truth which he could know, we call such an individual an unreliable witness.

We must always be cautious and not judge in haste. We must not question one's motivation lightly. But we may ask for truth.

Stone, a physician with a bent for philosophy, wrote that anyone who makes a scientific statement, must make sure that it has the:

...one indispensable prerequisite: it must have verifiable consequences....²²⁶

Sagan's statement certainly does not qualify. Under these circumstances Stone calls such a person a:

...purveyor of rubbish.²²⁷

What would Stone call a person who makes a statement that can not have any consequences because it clashes with everything science stands for?

Sagan is not alone in conveying the impression that abiogenesis has been proven. Many current textbooks on biology are guilty of this. And in that way most "educated" people have become convinced that it is a fact. It is now a near universal misconception. Since humanism is so prevalent, this could be expected. People want a scientific confirmation of their beliefs.

It will be very difficult to persuade any true believers that their faith is based on fraud. But it is extremely important to work hard to explode the myth on which the idolatry of materialism and humanism in general rests. Once abiogenesis has been exploded, the entire house of cards born by it will collapse. This is why our efforts will meet with some strong and unscientific opposition. It can be quite unfair.

It is tragic that many people often treat anyone who does not share their religious basis of humanism with abuse. Sagan writes that the suppression of new ideas that can cause major revolutions often occurs in politics and religion. But, he adds:

...it has no place in the endeavor of science. We do not know in advance who will discover fundamental new insights.²²⁸

We have no quarrel with this.

He is right in rejecting past attempts by the church to impose its explanations of bible texts on scientists. Kuhn has shown that scientists often cling to their beliefs, even when faced with anomalies and counter-instances.²²⁹

Whenever a cherished belief is threatened, we tend to over-react. Stone warns us of this as a dangerous tendency and gives us these warning symptoms and some sound advice:

...when the belief is challenged we respond with an upsurge of emotion ...stirred by the fear of losing a belief that brings peace of mind....Mistrust a strongly held belief if you find that in defending it you lose your temper and abuse your opponent.²³⁰

In the current debates between creationists and evolutionists this type of argumentation “ad hominem” is very common. You can find it in every issue of the periodicals that report on the public debates on this matter. The newspapers and other media indulge in this very often. Stone defines “argumentum ad hominum” as follows:

You prove something regrettable about your opponent’s character, or merely abuse him.²³¹

The most common form of abuse is to question a person’s intellectual endowment, to call him an ignorant fool. The other line of attack is to question his integrity as an honest scientist: to call him a crook. Such has been the response of the fifth category, of those who believe, or say they believe, that abiogenesis is a proven fact. It is based on ignorance or misrepresentation of known states of affairs in science. That is regrettable. But it is not new under the sun.

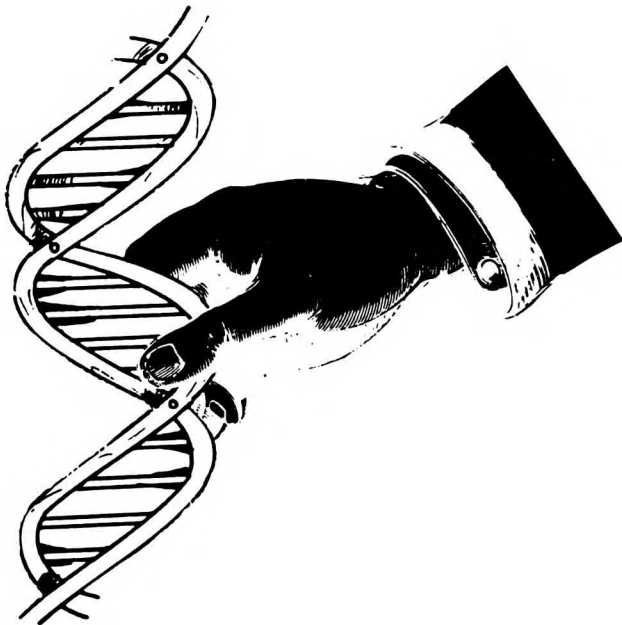
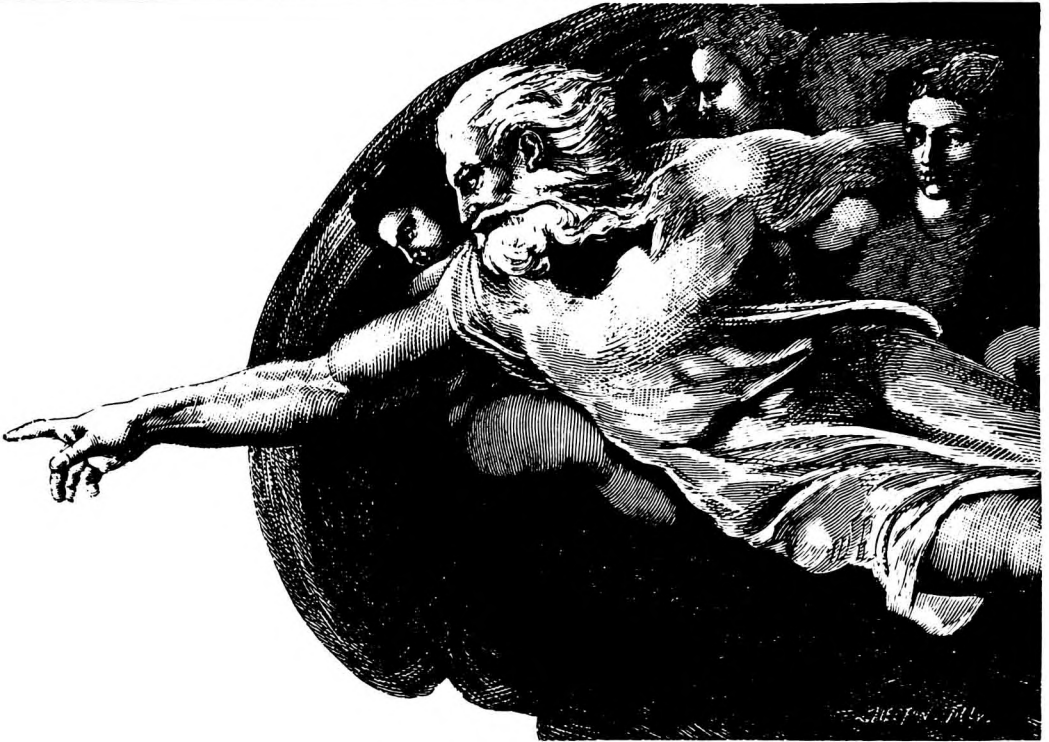
Theories may come and go, no matter what their adherents of past ages intended them to do. The theory of abiogenesis can not be proven by popular television shows put on by clever promoters. Nor will it be kept intact by its faithful and true believers who have no evidence. The cracks are showing plainly. The walls are crumbling and are certain to come tumbling down.

NOTES

199. L.S. Dillon, *Mechanism*, p. 93.
200. W.M. Elsässer, *The Chief Abstractions in Biology* (New York: North Holland Publish. Co., distrib. by American Elsevier Publ. Co., 1975), p. 217.
201. F.J. Ayala, *Studies*, p. xi.
202. *ibid.*, p. 70.
203. *ibid.*, p. 86.
204. J. Keosian in Dose, *Chemistry*, p. 226.
205. *ibid.*, p. 227.
206. C. Ponnampereuma, *The Origins of Life* (London: Thames & Hudson, 1972), p. 102.
207. *ibid.*, p. 143.
208. Henryk Skolimowski in Ayala, *Studies*, p. 212.
209. *ibid.*, p. 222.
210. Karl R. Popper in Ayala, *Studies*, p. 271.
211. *ibid.*, p. 269.
212. Paul Weiss in A. Koestler, *Beyond*, p. 49.
213. *ibid.*, p. 11.
214. *ibid.*, p. 45.
215. Proceedings of the 2nd I.S.S.O.L. meeting (Intern. Soc. for the Study of Origins and the evolution of Life) held at Kyoto, Japan, Apr. 1977, (Tokyo: Center for Academic Publ., 1978), p. 569.
216. *ibid.*, p. 572.
217. *ibid.*,
218. *ibid.*, p. 573.
219. A. Koestler, *Beyond*, p. 209.
220. C. Sagan, *Cosmos*, p. xiii.
221. *ibid.*, p. 30.
222. *ibid.*, p. 28.
223. *ibid.*, p. 38.
224. *ibid.*, p. 39.
225. *ibid.*, p. 42.
226. Kenneth Stone, *Evidence in Science* (Bristol: J. Wright & Sons, 1966) (Hereafter cited as *Evidence*), p. 36.
227. *ibid.*, p. 37.
228. C. Sagan, *Cosmos*, p. 91.
229. T.S. Kuhn, *Revolutions*, p. 79.
230. K. Stone, *Evidence*, p. 10.
231. *ibid.*, p. 110.

Part Six

The Words of God and the Laws of Man



We See, Conclude and Formulate

a. From animism to reality

Galileo saw the candelabra in church swing and began to experiment with balls rolling down an incline. Huygens made a clock with the aid of a swinging pendulum. Bernoulli had water flowing down a hole and up again into another tank; and each formulated theories to explain what happened. Finally Newton brought them all together under a unifying “umbrella” with the theory of gravity.

Others observed chemical reactions and electric phenomena. Added to these were the findings about weak and strong nuclear forces. Thus theories were formulated about the different forms of energy we see displayed. From all this the physicists eventually abstracted and formulated the laws which govern the functions of various material functors. This paved the way for distinguishing the aspect of energy.

When asked what gravity is, Newton replied: “I don’t know.” Nobel Prize winning chemist Pauling said the same when asked what a chemical bond is. Coulomb refused to define electricity and Ampere a current running along a wire. All these concepts represent functions of material things, and they have no “is,” no *independent existence*.

Aristotle had not learned yet what Newton knew. When he was asked what life is he said: “it is a substance which we call soul.” He made functors out of the life-aspect of living things. Like a cartoonist, he “animated” his abstract concepts and mistook his own “pictures” for the real thing as we saw in Chapter II. In effect, he assigned divine properties to his concepts. And so he *introduced animism* into science and fossilized it for two thousand years.

By deifying the life-aspect, Aristotle was a *vitalist*. But in the 18th and 19th century vitalism had to compete with a new form of animism: materialism. We saw that Needham, De Buffon, Schwann, Engels et.al. taught that physical rather than vital forces give rise to all living things. This belief was

reinforced by Darwin's theory of evolution. Again, abstract forces were given an existence of their own and assigned the power to create living things. Thus materialists were as much animists as the vitalists. (see Ch. III)

The Christians failed to free themselves of the animism of the vitalists and materialists. They failed to formulate their own scientific approach. They believe that God created the cosmos under His laws by the words He spoke. But they did not clearly see these *laws*, the idionomy of things, as an expression of God's word, of His cosmonomy. As a result, time and again they tried to assimilate animistic theories. Theistic abiogenesis is a glaring example.

It is no longer necessary for Christians to be silent on this matter. We no longer need to flirt with the animism of humanists. We can now turn to reality as God gives it to us. The findings of the biologists have pointed the way out of the dilemma. And Dooyeweerd was the first to distinguish the aspects as we discussed them in Chapters XI ff. He exposed the distortion caused by their deification.

Dooyeweerd has given us the tools to understand reality better. He has provided us with a greater insight into the significance of the laws of creation, in contrast to the humanistic meaning of the "laws of nature." We can now abandon animism and face the real world. Let us now have a look at how we must apply this knowledge.

b. The laws of God for the cosmos He made

Descartes had seen the interaction between material bodies in terms of direct contact. In the case of stars and planets, he assumed that something called *ether* filled space because there could be no void. This provided the medium to make the "push and pull" between them possible.

When Newton introduced his theory of gravity, the Cartesians accused him of introducing an "occult" power into science. Action at a distance went against everything they had always known. Gravity had to be an occult force since no one, not even Newton, could explain what it was.

Biologists have tried everything for explaining what it is that makes an organism "push and pull" the myriads of atoms, electrons and molecules in their immensely complex interactions inside its body. They have called it soul, physical organization, mechanical system formation and vital force. And all ended up proclaiming some animistic power at work.

To my knowledge, no one today tries to speculate about the origin of physical energy. Where did gravity come from? How did electromagnetic interaction come into being? How did weak and strong nuclear "push and pull" arise? I am not aware of a theory which tries to explain the emergence of these "forces." Together we abstract them in the aspect of energy from functions displayed by functors.

Scientists may succeed in bringing them together under an umbrella of a general unified theory (GUT). They still won't know the source of this unified force. We don't know what physical forces are, either singly or combined. They are not observable functors. So we cannot hope to find them and observe them. We have a similar situation with the concept of life.

The reason we cannot "see" life and therefore not explain its function is the same as that for energy. It is an irreducible aspect of real functors. Aspects can not be observed. We see phenomena, we observe functors in their many ways of functioning and then *abstract* the concept of an aspect.

Because life is a non-observable aspect, we cannot search for its origin. We cannot find the origin of an abstract aspect of real things. We can discover only where individual living things come from. With the help of modern methods, including those of microbiology, we have learned a lot about that.

One of the statements C. Sagan made which we could agree with is the one about the laws of "nature" which, he says, make science possible. Without them we can make no predictions. But just as we cannot find the origin of aspects, we cannot find out where these laws came from through scientific experiments.

Sagan, Monod and many others *believe* that the laws of nature have always been and will always be the same. Dialecticians such as Oparin believe that new laws can emerge in the course of time. In either case, there is no way to prove the point. It remains an article of faith. As Stone says:

When the belief concerns some fundamental concept like the uniformity of nature or a religious tenet, we say that this springs not from credulity but from faith.²³²

And also:

The faith of the scientist is in the uniformity of nature. He believes that the universe is governed by a few general laws and that everything that happens in the universe happens in accordance with one or more of the innumerable uniformities that we know by observation...²³³

In *Studies in the Philosophy of Biology*, W.F. Thorpe has some harsh words for chemists and other scientists who talk about life and its laws and:

...who expiate upon matters of philosophy (but)...have never got around to asking themselves what their own philosophy really is.²³⁴

The theories about the origin of life and the emergence of its "new" laws are "far too simple minded." And reductionism:

...amounts to nothing more than blind faith unsupported by valid scientific evidence.²³⁵

So we are not without company when we claim that our scientific work is founded on a religious faith. It is the belief in the *lawfulness* of the functioning of all functors in the cosmos.

But once we are convinced that the laws of nature are not changing, we still haven't discovered whence they came. The humanist who rejects emerging laws has no scientific answer to that question. He merely *believes* that they have always been there.

The Christian, Jew or Muslim knows the answer. He knows, not through science but through faith, that God created the universe and gave the laws that govern them. So now we must put our faith to work. In order to do this, we will examine a scientific theory about the laws God made for His creatures in His cosmos.

c. From autonomy to teleonomy to idionomy

The humanist who rejects God the Creator of the cosmos has lost sight of the origin of the laws through which God upholds it too. If he believes that the universe has always existed, his belief does not even discuss its origin. And if he believes that it had a beginning, he cannot explain its origin either. His scientific law on the conservation of energy stands in his way.

We believe in God, Creator of heaven and earth. And we believe that He upholds His creatures through His word. He has set the laws for their functions. How do we translate this into the way we practise our science?

In Chapter XXIII,a. we introduced Dooyeweerd's theory of encapsis and noted that he sharply distinguished between a functor and its functions. He called a functor a "subject" because it is subjected to God's laws for its functions. And its "law-side," the body of laws to which the functor is subjected, he called its "individuality structure." Because this term has given rise to some misunderstanding, I have translated it with *idionomy*. *Idios* is the Greek word for "particular" and "peculiar" and is used also in "idiopathic" and "idiosyncrasy."

Since the humanist cannot indicate whence came the laws that govern the process of the growth of living beings, he must find another approach. So he talks as if it is self-evident that the process causes itself. It is "autonomous." "Autos" is self. He speaks for instance of "autonomous morphogenesis," i.e. growth.²³⁶

Aristotle believed that one of the causes of the laws that govern the growth of living things is the purpose for which they strive: to grow up. That concept became known as "teleology;" – *telos* = purpose or goal. But this idea was later rejected. How can a functor which cannot look into the future, e.g. a fertilized ovum, have a goal or purpose in sight? As Pittendrigh writes:

Teleology in its Aristotelian form has, of course, the end as immediate, 'efficient,' cause. And that is precisely what a biologist cannot accept: it is unacceptable in a world that is always mechanistic.²³⁷
(quoted in Mayr p. 392 footnote.)

Even modern biologists cannot escape the impression that living things are "end-directed systems."²³⁸ They see a purpose in organic development that seems to follow a lawful pattern. Of course, they want to avoid all accusations of regressing to Aristotelian metaphysics. Yet they want to express this "directedness." So Pittendrigh coined the word *teleonomy* in 1958. It has been used by many major scientists ever since.

Ernst Mayr defines teleonomy this way:

*A teleonomic process or behavior is one that owes its goal directedness to the operation of a program.*²³⁹

Teleonomy, it was felt, escapes the false implication of teleology "that the end is causally effective in the current operation of the machine."²⁴⁰

We hope to have convinced you by now that living things are not machines. Neither do fertilized eggs have the benefit of foresight to know where they are going in their growth. They are neither autonomous nor teleo-nomous. They "follow a different drummer." They obey the laws of their Creator. They are *idionomous*.

The philosophy of COSMONOMY rests on the faith in the Lord of creation as revealed in His word. But it has given scientists some useful new tools for analysis.

Through his philosophy Herman Dooyeweerd has given us:

1. The recognition of aspects, inseparable and irreducible.
2. The distinction between functor and function with the idionomy that governs them.
3. The encaptic relationship between functor and function and the captive constituents of the encaptic whole.

Because of these distinctions, we can now better recognize the laws through which God maintains each creature. Our scientific analysis brings out the wonderful ways He employs to do so.

Gone are the animistic crutches the humanist needs to "explain" what he sees. Gone is the need for explaining his "riddles." He caused those riddles in the first place with his misplaced urge to reduce everything to some deified aspect or other. Gone is also the urge to search for the unsearchable: the origin of life.

There is nothing that gives greater comfort to a Christian scientist than the realization that it is his God Who upholds him in all he does. That holds for man, for sparrows, and subatomic particles alike. We knew this all along

by faith. Now our scientists have lost all arguments that claim they can reduce one aspect to another. They have lost all opportunity to support abiogenesis. They can no longer use scientific arguments to contradict the words of the Lord in this matter.

As scientists, we can do nothing better than investigate the laws through which God maintains His creation. And so we have travelled the road lined with humanistic concepts of the autonomy of their own inventions. We know that teleonomy is a logical impossibility. We began to see a glimpse of the divine plan, the idionomy which God gave to the world. To discover some of that is a wonderful experience. It is one way in which we can honor Him Who made it all in His wonderful way.

NOTES

232. K. Stone, *Evidence* p. 2.
233. *ibid.*, p. 65.
234. W.H. Thorpe in Ayala, *Studies*, p. 114.
235. *ibid.*, p. 116.
236. J. Monod, *Chance*, p. 16.
237. E. Mayr, *Diversity*, p. 392, footnote.
238. *ibid.*, p. 391.
239. *ibid.*, p. 389.
240. *ibid.*, p. 392.

Theory And Faith

a. From theory to faith

We have seen that the Reformation failed to reform the scientific endeavor of the Christian world. When Luther and Calvin had to establish new institutions for learning, they failed to exorcise the animism of ancient Greece from their curriculum.

Through the efforts of Melanchthon and Beza, the metaphysics and logic of Aristotle were restored to their old position in the Protestant universities. And thus the perpetuation of animism in reformed thinking was guaranteed. That sealed the fate of any attempt by reformed Christians to establish a uniquely Christian manner of practising science for centuries.

Meanwhile the men of the Renaissance set out to explore the laws that govern everything they could lay their hands on. They began to uncover the functions of many things. They found how functors of different types display various aspects. And each newly discovered aspect led to the establishment of a new scientific discipline, even though the aspects were not recognized for what they are.

As long as a researcher would refrain from animistic speculation, he had the opportunity to discover some true scientific laws. He could unravel the idiomony of the object of his study. He found true states of affairs as long as he was not distracted by the doctrines of the various sects of humanism. Many booked great successes by basing their investigations on the tacit assumption of the faithfulness of God to His laws. They assumed this by accepting the “uniformity of nature.”

As soon as man rejected the Creator, he replaced Him with a substitute. In that way animistic belief gained access to a branch of science. And immediately speculation and fiction would enter through the back door, complete with circular reasoning and other flaws in logic. This resulted in the proliferation of all the -isms we hear of today. They flooded the schools of higher

learning. The competing philosophical systems created chaos and confusion in people's minds.

This great confusion brought Dooyeweerd to study these things. He found opinions to be as divided in his own field of study – jurisprudence – as they are everywhere else. And so he began to trace the problems of science back to their origin. He ended up in the era of the earliest Greek religion of nature. There he found the cause of the trouble. As we have seen, it was the habit of man to assign the power of creation to abstract concepts of his own making. It was idolatry, the worship of some product of his own thought.

A fine example of such idolatry is the deification of the numerical aspect practised among the pupils of Pythagoras. They assigned divine status to numbers and worshipped them. Here is a prayer to the number of ten:

Bless us, divine number, thou who generatest gods and men! O holy, holy tetraktys, thou that containest the root and the source eternally flowing creation! For divine number begins with the profound, the pure unity until it comes to the holy four; then it begets the mother of all, the all-encompassing, the all-bounding the first born, the never swerving, the never tiring holy ten, the key-holder of all.²⁴¹

Another example of this type of idolatry comes from a great scientist of more recent date: Johannes Kepler. He was so impressed with his findings in astronomy that he deified the aspect of space. He wrote:

Geometry existed before the Creation. It is co-eternal with the mind of God. Geometry provided God with a model for the Creation....Geometry is God Himself.²⁴²

Dooyeweerd mentions a few of the -isms that emerged in the minds of humanistic thinkers: logicism, symbolic formalism, empiricism, intuitionism, mathematicism, psychologism, dialectical historicism and a host of others.²⁴³

From all this he concluded that each scientific discipline could lead to one or more new *religions*. Each time an aspect of some real functor was deified, a new idol arose, be it of the concrete or an abstract variety. And throughout all this science and religion were never separated. He found that even thinkers who call themselves agnostics cannot separate them.

We begin with formulating scientific theories and end up with belief in the basis for our science. We end up with our belief in the nature and origin of reality. We begin with theory and end up with faith.

b. From theory to religion

Dooyeweerd began with the study of all these idols, “aspects” of reality which man deified. From this he concluded that there must be some element

of truth in distinguishing them. They express a portion of the manner or “mode” in which we experience reality. And so he arrived at the distinction of all these aspects. He was the first to do so in a systematic manner.

He set out the result of his analysis of the history of the development of all these aspects and their subsequent elevation as idols in his *A New Critique of Theoretical Thought*.²⁴⁴

He showed that not one of these aspects can be reduced to another one. If we try, we already have declared that aspect to be independent of the others. The others depend on it, which means that we declare it to be divine. We have made it into an idol.

The theoretical result of his investigations was the discovery that the distinction of the “modal” aspects corresponds to something quite real. Each creature displays its aspects in a typical manner. This caused him to formulate the “modal theory.” This theory of the aspects can be found in Vol. II of this work.

Each aspect is a mode of being which the objects we observe display. So far we have come across the aspects of number, space, motion, energy and life. Animals show a sixth aspect: that of feeling, emotion or senso-motoric functioning. The animal displays this aspect in the manner it directs its lower functions.

Man shows a number of aspects that are unique. They allow us to recognize our fellow humans for what they are as distinct from every other living being. They are the aspects of:

7. *logical thinking.*
8. *exertion of power over things and people around us.*
9. *transmission of information through the use of symbols.*
10. *social interaction with our fellow men.*
11. *economic use of scarce resources of a material and spiritual nature.*
12. *esthetic experience.*
13. *equal treatment of our fellow men – justice.*
14. *exercising love for our fellow men: moral treatment.*
15. *having faith in a divine power upon whom everything else depends for its existence.*

We often fail to realize that all these aspects are uniquely human. No creature displays them except human individuals. There are no logical, social, economic, historical forces that have an independent existence and that can in turn influence our life. When we claim that man is ruled by the “world spirit” which rules history, as Hegel said, we deify the aspect of historical or cultural power. That was Hegel’s form of animism. There are many more.

It will be clear that scientific disciplines differ because they study different *aspects* of things. Mathematicians, geometers, kinematics experts, physicists and biologists can all study the same chicken. Each can contribute

to our knowledge of the beast. But they can enlighten us only about the special aspect of chickens they study.

Each must know his proper place in the hierarchy of science if he is to make a sound contribution. If he begins to reduce other aspects to his special aspect, he begins to speculate. He assigns divine status to his favorite and ends up in animism, in a false religion. This reductionism can only result from a denial of the Creator Who has made everything with their aspects, none of which can take His place. *Reductionism is idolatry*. Denial of the irreducibility of the aspects can easily lead to idolatry as history shows.

Every scientist takes a religious position in his own area of expertise. He either holds that God has created the things he studies or he believes in another origin for them. In this way he chooses what he believes to be divine. That is his religion. Whether he realizes this or not does not alter this fact. Man does not have

...to pray to subatomic particles or sing hymns to force fields....²⁴⁵

in order to believe that physical entities and their laws are divine. He can merely believe that they are not dependent on anything else for their existence but that everything else depends on them. And this is then his definition of what he holds to be divine, to be his god.

Everyone of us functions in this faith aspect, says Dooyeweerd. Regardless of what we believe, our faith function:

...is ruled by the laws of this faith aspect.²⁴⁶

Through our faith-functions we *must* show that we believe in something as the divine, as the non-dependent. None of us can escape these laws that control us in our faith-aspect. Some of those functions of faith are worshipping, praying, confessing. Through them we show *what* we believe in. Religion is what we believe in, in *whom or what* we put our faith. "Religion is the *content* of our faith."²⁴⁷

c. God's laws for human thinking

The laws of logic form the framework for our thinking, both in theory and in practise. We cannot analyze anything without obeying this body of laws, the idionomy for thinking. It is the indispensable datum for our thinking as human beings.²⁴⁸

When we ask a Jew, a Muslim or a Christian: "where did the cosmos with all its laws come from?" the answer is: "The Lord created it, along with all its phenomena and the laws He set for them. It includes our thinking and its idionomy."

If we ask the same question of others, their answer varies greatly. But once they have denied that there is a God who transcends the cosmos, they become “earthbound” in their search. The origin must be found among created things and be declared not dependent on anything else, i.e. divine. What they hold to be divine becomes their idol.

Now let us ask: “And how did He carry out this act of creation?” The members of the first group must answer: “We do not know. That lies beyond our field of experience.”

How can we creatures establish the origin of our scientific thinking while using the thinking whose origin we seek? The question is not a scientific one. The cat is chasing its own tail. We can only have a preconceived notion about such a question. The answer depends on our faith. It belongs to the content of our belief. It is a part of our religion.

The others have no alternative. They must give the same answer. They too cannot give a scientific answer to a non-scientific question. They too have a preconceived notion about it. For them too the answer is part of their religion.

The proposition that God is the Origin Who created the universe cannot be subjected to scientific tests. *It is a religious proposition.* Its alternative is the religious negation of the Creator. And since its adherents cannot escape their own idionomy, they too must keep searching for their origin. They too come up with a religious proposition. They end up with the proposition that: “Everything is *nothing but...*,” i.e. something in creation. They end up in deifying that something that was created. They end up with animism.

The denial of God results in a “nothing but” religion. It ends up in declaring a creature to be a creator. This is a lie and therefore means nothing. It empties the life of its confessor and of the cosmos around him of meaning. It brings him nothingness or *nihilism*, the religion of emptiness. It is the nothingness of the man who tried to go beyond his limits. He got lost and never found the meaning he was looking for.

So now man has arrived at the station he finds at the end of the road away from God. It is “nothing but” a black hole of questions with no answers.

First, he decided there is no Creator. Then he began to formulate his theories about all the things he observed along the way. Theoretic thinking follows the sign which our religion puts alongside the road.

Belief in the *Creator* can bring us to analyze reality as He gives it to us. Belief in a *creature* condemns our analysis to getting bogged down in animistic speculation.

And so we find that religion determines the beginning and the end of our scientific work. This is how faith directs our theory formation. Such is the law, the idionomy set for human thinking.

NOTES

241. Quoted in R. Clouser, *What is Religion?*, unpubl. mss., p. 26.
242. C. Sagan, *Cosmos*, p. 56.
243. H. Dooyeweerd, *N.C.* vol. 1, p. 46.
244. A good introduction into Dooyeweerd's philosophy can be found in L. Kalsbeek, *Contours of a Christian Philosophy*, see footnote p. 125.
245. R. Clouser, *What is Religion?* p. 26.
246. H. Dooyeweerd, *N.C.*, vol. 2, p. 298.
247. *ibid.*,
248. H. Dooyeweerd, *N.C.*, vol. 1, p. 37ff.
249. L.S. Dillon, *Mechanism*, p. 360ff.

The Ultimate Question: The Meaning of Life

a. Diversity and meaning

What is the purpose of the life of a bacteriophage T4, whose main preoccupation is to eat and destroy *E. coli*, the bacteria we have met several times in previous chapters? We noted that one cubic centimeter of a sugar solution can contain 3 billion of these bacteria. If we think that those bacteria are small, we have not seen T4 yet. It is many times smaller still. But it is deadly.

T4 has a head, a neck and a tail, and at the end of its tail it bears fibers. When it meets a bacterium, it backs up, tail fibers first, and with them attaches itself firmly to the bacterial membrane. Next, it lowers its tail on this membrane and begins to inject the contents of its tail into the bacterium. When this is done, the contents of the head follow: its DNA and a number of other molecules such as enzymes.

Once inside the *E. coli* body, the viral DNA unwinds: it was coiled up in the head and now turns out to be 500 times as long as its head is wide. And now its deadly work begins. It slows down the synthesis of DNA, RNA and proteins of *E. coli*. It forces the bacterium to manufacture viral constituents instead. And so the virus multiplies with the help of the constituents of the bacterium. And when a certain point in time has been reached, the bacterium dies and the synthesis of new constituents of T4 stops. Now we can see T4 DNA molecules appear which coil and form new heads. These get connected with new necks and tails. And now a host of new T4's is ready to swarm about in search of new victims.²⁴⁹

According to Dillon, who describes this process in detail, there is no doubt about the fact that viruses are not dead, complicated crystals, but living organisms of a most complex structure. They cannot make some of their own constituents and must "steal" them from their victims. In fact, they force their victims to make them to suit their own purpose. Still, they are organisms "...as seems self evident..."²⁵⁰

If this is true, what then is the purpose of life in one of the smallest of all known parasites? Why does it exist?

There are little creatures abroad in fresh water that carry a little blow pipe through which they shoot poison at their prey. The poison paralyzes the victim, which is subsequently eaten. The name of this little hunter is *Hydra*.

Our clever little sharpshooter in turn has an enemy which is much larger: it is a worm that wriggles in the water with all of its impressive one-half millimeter of dangerous body. It likes to eat our carnivorous friend *Hydra*, blowpipe and all.

When it arrives in the stomach of our worm – whose name is *Microstomum* – its blowpipe is carefully separated from the rest of its body, which is digested. Our worm absorbs the pipe through its stomach wall, transports it to its skin, and lets its loaded barrel point to the outside while inside at the other end a trigger mechanism is attached.

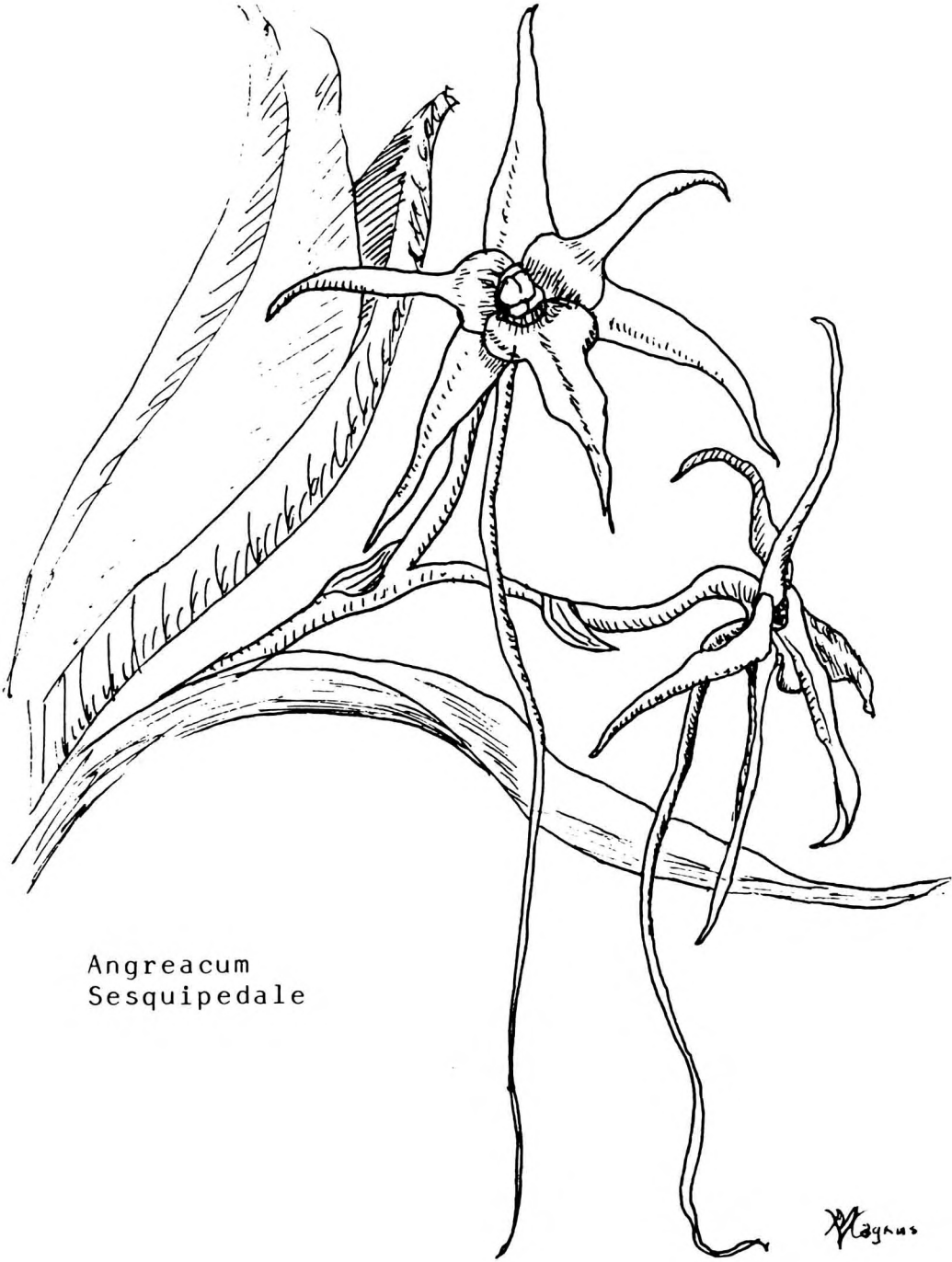
Each of these small worms can take a certain number of these blowpipes and thus swims around, bristling with an array of loaded “guns” which it shoots at potential victims, to be paralyzed and eaten. But once the worm is fully armed and “loaded for bear” with its maximum complement of pipes, it will not eat a single *Hydra* until it has discharged some pipes first. It will rather starve to death than eat one more if there is no room left in its skin.²⁵¹ And again, what is the purpose of life for these little hunters with their marvelously complex apparatus? Why should they be there?

I grow orchids for a hobby. One of my favorite beauties is a species from Madagascar with a gorgeous white and starshaped flower. In the center it has a spur, a narrow tube, 14” long. And at the bottom of the spur is the nectar. The name of this orchid is *Angreacum Sesquipedale* (fig. 3, opposite). Charles Darwin studied the fertilization of orchids in Madagascar over 100 years ago and predicted that there must be an insect with a tongue at least 14” long for reaching the nectar and thus fertilizing the flower. Several decades later this moth was found: *Xanthopan morgani prædicta*.

Now what is the purpose of life for our orchid and for the moth, a plant and an animal that need each other for maintaining their species?

Humanist biologists do see a purpose in the development of individual organisms. From Aristotle to Monod and Oparin, they use the word goal, purpose – telos. It is the goal of growing into a mature adult. They even see the individual members of a species conforming to a law – nomos – demanded by this purpose. Modern biologists speak of *teleonomy*, the term coined by Pittendrigh, as we noted before.

As with Aristotle, the goal, the telos, which is an abstract concept, is said to give rise to a law, the nomos, which governs growth and maturation. Even the maintenance of the species becomes a “goal.” They wish to explain this goal-directedness for which they recognize no law-giver. But then they *must*



Angreacum
Sesquipedale

Figure 3

resort to animism. They must assign the power of direction to the abstract concept of goal. Once again, they must resort to “substituting voodoo formulas for understanding.”

The ultimate question of purpose does not come up for plants and animals. In the universe only man is capable of asking such questions. A humanist like Monod may claim that the question is redundant. Abiogenesis did not occur in a universe “pregnant with life.” But he is still puzzled: his “riddle remains.”

For the humanist the question ought to be irrelevant. Living beings have no one behind their birth. Their “number came up in the Monte Carlo game.” Yet we observe the diversity of the organic world and find it truly incredible in its individual functions and its intricate interplay. Somehow it all “hangs together.” But what is the purpose behind this immense diversity? What is the meaning of its existence?

b. Teleonomy and idionomy

There can be no question about it: no living being below the level of homo sapiens knows there is a future. Only we have a goal, a purpose for what we do. Only man has a “telos.” Hence the word teleonomy in biology has no foundation for its use below the human level. Even in this terminology humanists show their animistic faith.

The question of meaning is more complex. Is there any meaning in the existence of the T4 virus, in *E. coli*, or in a sequoia tree? To whom does it mean anything whether all the little hunters eat and in turn get eaten by larger ones? To whom does it mean anything whether a little flower blooms in a crack of rock high up in the mountains, never to be seen by man? Clearly, there is much in the world and especially in the farthest reaches of time, in the very remote, in the subatomically small and in the unimaginably numerous, of which man has no knowledge. And in what he does see he is hard put to see a clear meaning. What is the meaning of the cosmos with all its functors, dead and alive?

Monod believes that the evolution of man’s brain probably gave rise to man’s

...need for an explanation, the profound disquiet which goads us to search out the meaning of existence.²⁵²

But elsewhere he claims that there is as little meaning as there is to a game of roulette. From a human point of view, there is no more meaning to life than there is to the rolling of the little ball of the croupier at the roulette, i.e. none. The outcome of his sect of humanism: mechanistic materialism, is a negation. *This is nihilism.*

The foremost dialectical materialist of biology until his death in 1980 undoubtedly was A.I. Oparin. For him the difference between life and other forms of matter was merely one of a different quality:

...which obliges us to regard life as a special form of the motion of matter.²⁵³

All he can hope to find is what Heraclitus and Aristotle searched for:

One can only understand the essence of things when one knows their origin and development.²⁵⁴

But we know now that he can never find the origin of life where he seeks it. So, in spite of all his high expectations, he will never understand its essence. His search is doomed to fail. His journey has no beginning in reality and ends up in the mists of animistic mythology. For that reason, *the whole dialectical materialistic sect of humanism turns into nihilism as well.*

A scientist can only establish true states of affairs and from them abstract his universal propositions. He tests them and when confirmed and not falsified, they are called “natural laws.” All he can do is discover the idionomy of creation. He cannot “create anything out of nothing.” He *investigates what has been created.* He traces its idionomy.

Many a scientist has the irrepressible urge to ask the ultimate question of purpose and meaning of it all. That “disquiet,” Monod says,

...has created all the myths, all the religions, all the philosophies, and science itself.²⁵⁵

This sounds as if man is the origin of everything he knows, of religion, philosophy and science. But he turns the world upside down. Everything is given to him for his examination. And the “disquiet,” the restless urge to seek the origin of reality was created in him by the same Origin Who created all the rest of the cosmos. It is, says Dooyeweerd:

...the basic genetic tendency of philosophical thought as directed toward the origin.²⁵⁶

Man begins with asking for understanding the relationships of created things. He starts with science. And he ends up with asking for their origin. In that sense science, philosophy and religion are closely related activities of man. That too is part of his idionomy.

The origin of everything is the word of the divine Creator. Its idionomy, the laws we find in science, is an expression of God’s will. Through that idionomy He maintains it all. And the purpose of everything is to fulfill His will. That purpose lifts all of creation out of the “chaos,” out of the nihilism into which unbelieving man has sunk.

Now we can answer the question we posed at the beginning of this Chapter regarding our hunters and plants, mostly never seen by man. They follow their idionomy. They have no choice. And in doing so they honor their Maker. *He alone knows their purpose and the meaning of their existence* in the cosmos. He gave it to them when He made them, and He was pleased with what He saw. He does not need our advice or recognition. And all we can do in science is find the idionomy of things and worship their Creator.

Man marches on the same road as plants and animals but to a different rhythm. He was endowed with his spiritual aspects, from the logical to that of faith. He has the freedom to choose between obeying and rejecting the idionomy which God set for him in each of these aspects. Through that he displays his unique make-up. He can disobey but not escape his idionomy. He still seeks and cannot help but seek the purpose and meaning of his life. He must follow the path that leads to his origin:

Philosophic thought cannot withdraw itself from this tendency towards the origin.²⁵⁷

Man's idionomy forces him to place his faith in the divine force that brought the universe and himself into being. He is driven by the idionomy of his faith-aspect to *believe* in this force and from there to follow the same law in his philosophical and theoretical thinking. Only after no more questions can be asked and man has found his true Origin

....does philosophic thought attain to the Origin, and is it set at rest.²⁵⁸

Alas, the humanist believes in something that he thinks up himself: an abstraction. He then endows it with power and so "creates" a myth. It is as much an idol as those made of wood and stone by pagan worshippers throughout history. Since the humanist credits non-existing gods with origin, it does not surprise us when he discovers that his self-made gods give him no purpose and meaning in life. He has cut the living heart out of reality and himself.

Now man is left only with the idionomy he finds in science. The purpose and meaning has gone from everything, himself included. He ends up in nihilism – nothingness. And that creates what psychiatrist Viktor Frankl calls the *existential vacuum*, with all its dire consequences for man's spiritual and mental health.²⁵⁹

The cosmonomist on the other hand knows that his Creator gave everything its meaning by giving it its idionomy. And this puts science on a firm footing, for it allows us to search for this idionomy of all creation. This increases our awareness of the greatness of Him to whom we owe our existence and *from whom are our idionomy, our purpose and our destiny.*

c. The answer to the ultimate question

It is time to sum up. We have followed the reasoning of humanists of various persuasions. They began by rejecting the Creator. That created a “power vacuum.” What power brought forth the universe?

No humanist has as yet come up with an explanation for the origin of the cosmos with its energy-laden particles, be it with or without a big bang.

We noted that, with God out of their picture, the humanists of necessity had to invent substitute gods in order to explain the development of everything. The prime example of this was their attempts at explaining how life originated on earth through a flight into animism.

Like king Tantalus, they suffered grievously. First they sacrificed their relation with the Lord, their Creator. That put them at the mercy of their own fantasies. And, as a result of that, they lost much of their scientific insight. Once they no longer recognized the Source of the laws of creation, they lost a proper understanding of the way they function. They lost what they cherished most: their scientific method.

In order to explain the idiom of things, they now had to personify the concept they had first abstracted. They had to invent “occult” forces that had to do what the Creator and Maintainer does. It explained nothing.

They invented abstract powers that make atoms as captors keep their captive subatomic particles under their direction. It did not explain anything. The same happened to their explanation of what makes living beings direct their captive constituents. They “substituted voodoo formulas for understanding.”

The results of all their efforts have been as disheartening as the efforts of king Tantalus. They have not found the origin of life. They have no hope of ever finding it. The more honest and less prejudiced among them tend to feel that the theory of abiogenesis is not even a scientific theory. Life *cannot* have arisen as the theory demands.

Humanists began with rejecting God. They subsequently failed to find the origin of life on earth. They began to worship self-made idols. They abandoned Popper’s criterion that tries to demarcate science from metaphysics, and they missed Monod’s postulate of objectivity. In the process, they lost sight of the true purpose of human life: to honor the Creator and to love our fellow men whom He created in His image. In this way life lost all the meaning, for the individual as well as for society.

Now, like old king Tantalus, man the humanist is condemned to forever grasp at *tantalizing* unattainables. The purpose and meaning of life will be forever outside of his reach.

But, while we are still alive, we do not have to suffer the punishment of our Greek. We can return to our Creator. This will give us a better perspec-

tive in our scientific investigation of creation. But above all, through the love and sacrifice of Jesus Christ, we will again be accepted as His child. Then our life will once more have meaning.

NOTES

250. Dillon, *Mechanism*, p. 406.

251. T.H. Thorpe in F.J. Ayala, *Studies*, p. 118.

252. J. Monod, *Chance*, p. 167.

253. A.I. Oparin (1962) p. 6/7.

254. *ibid.*, p. 37.

255. J. Monod, *Chance*, p. 167.

256. H. Dooyeweerd, *N.C.*, vol. 1, p. 9.

257. *ibid.*, p. 11.

258. *ibid.*, p. 11.

259. Viktor Frankl, *Man's Search for Meaning*, trans. Ilse Lasch (New York: Pocket Book, 1973 [Boston, Mass.: Beacon Press, 1959]), p. 204/5.

Glossary of Terms

ABIOTENESIS – The rise of the first living being on earth through a random interaction of inanimate atoms and molecules. No supernatural power is involved but only the “natural” forces of physics and chemistry.

ALLOSTERIC ENZYMES – Like other enzymes, these protein molecules combine with a specific type of “substrate” molecules and change them into another specific molecule. In addition, allosteric enzymes are slowed down or speeded up by one or more other molecules that “fit” into them in a three-dimensional configuration.

ANIMISM – the belief that inanimate objects and natural phenomena have a soul or spirit. The belief that life-phenomena are caused by an “immaterial” soul, spirit, vital principle or *anima*.

ANTINOMY – (anti – against and nomos – law) A logical contradiction. We contradict ourselves when we make a statement that violates the laws that hold for what we are discussing.

ASPECT – A fundamental way, or *mode* of being which concrete things exhibit. They are not things. We distinguish them as the manners or modes in which these things present themselves to us in our experience. When we analyze something in our theory, we mentally separate its various aspects and describe them, e.g. the aspects of number, spatial extension, motion, state of energy, life-phenomena, etc.

AUTONOMY – (autos – self and nomos – law) The having or making of one’s own laws. Independent existence.

CATALYSIS – The chemical change in one molecule caused or accelerated by another one which itself does not change in the process.

CHROMOSOME – A structure in the nucleus through which the cell stores “information,” needed in its propagation.

COACERVATE – A droplet containing a solution of organic material and suspended in another fluid.

CODON – A sequence of adjacent nucleotides in a DNA or RNA molecule which a cell uses in the making e.g. of proteins.

COLLOCATION – The placing together of circumstances or things.

CORPUSCLE – A little body, e.g. a red blood cell.

COSMONOMY – The philosophy which holds that God put all of creation under specific laws for its functioning.

CO-VALENT BOND – A chemical bond between two molecules that involves very little energy. They are closely connected and “fit” into each other in a specific manner in space: they are *stereospecific*. Example: the bond between an enzyme and its substrate. Such bonds are usually unstable in contrast to non-co-valent bonds.

CYTOPLASM – All the living parts of the cell outside of the nucleus.

DEMIURG – The maker or creator of the world in Plato’s philosophy who fashioned it out of pre-existing matter.

DIALECTICS – The art of discussion. Sometimes means a conflict between two lines of argument that can not be resolved.

DNA – Deoxyribo-Nucleic Acid. Most living beings contain these large molecules. Each species has DNA of a different chemical structure. It usually consists of a row of smaller molecules called nucleotides in two rungs side by side like the frame of a ladder. They interconnect like the rungs of the ladder. The two frames, made up of strings of nucleotides are called poly-nucleotides. See picture on page 46.

EMERGENCE THEORY – The theory that living beings arose in the ancient oceans through a slow process of chemical reactions that got more and more complicated. This gave rise to ever more complex molecules which gradually acquired the characteristics of living beings with their laws of biological behavior.

ENCAPTIC WHOLE – An entity like a molecule or a living being which holds smaller entities captive. These “captives” function under their own laws as usual, but not with the same freedom. Thus atoms are restricted in their movements by the larger molecules in which they are held captive. Molecules cannot move at random inside a living being that holds them captive. The larger *encaptic whole* imposes restrictive laws on its smaller constituents.

ENCAPSIS – The theory that expresses the laws which hold for the interaction between the encaptic whole and its captive constituents.

ENDOPLASM – The plasma inside the cell.

ENZYME – A protein molecule which speeds up a chemical reaction without itself changing in structure. Living beings produce millions of these and each enzyme speeds up only one specific reaction, up to one hundred thousand times the normal speed at body temperature.

EQUIVOCAL – Of double or doubtful meaning. Syn.: ambiguous.

FUNCTOR – An entity which can function, just like an actor can act. Functions do not exist except as a property of a functor.

GENE – A single or double section or string of nucleotides along a nucleic acid molecule. The cell employs such strings in the manufacture of molecules such as proteins in a manner which resembles the use of a template.

GOLGI APPARATUS – Small sacs inside the cell where it stores powerful enzymes that could harm the cell when let free.

HUMANISM – 1. The quality of being human. 2. Devotion to the study of human culture. 3. A system of thought which is concerned merely with human interests, as distinguished from divine. In this work humanism is used in the third sense: a system of thought which denies there is anything divine in the universe. That holds especially for the origin of all things, including living beings.

IDIONOMY – From *idios* – particular or peculiar – and *nomos* – law. It expresses the lawful order of concrete things set by God’s word for His creatures. It is a synonym for the term “individuality structure,” used in the translation of Dooyeweerd’s philosophical works.

INHIBITOR – In biochemistry the name for a molecule that slows down the activity of an enzyme.

LIGASE – An enzyme which can speed up a chemical reaction through which small molecules are linked together to form a polynucleotide chain.

LYSOSOME – Sacs in the cell filled with enzymes that either break down large food molecules or that engulf and destroy harmful bacteria.

MATERIALISM – The belief that nothing exists but matter and its properties. Everything else is held to be a special case of complicated composition of matter.

METABOLISM – The chemical processes which a cell uses to break down molecules obtained from food and to build them up into the specific molecules the cell needs.

METAPHOR – The figure of speech by which we transfer the name or descriptive term from the object for which it is normally used to another one that “looks or acts like it.”

METAPHYSICAL – A branch of reasoning dealing with abstract matters. Often used to distinguish reasoning based on factual observation from reasoning which is held to be speculative. Also often used to contrast “real” scientific theorizing with reasoning that deals with “supernatural” matters. Some hold everything that cannot be explained by the theories of physics and chemistry to be metaphysical.

MICROANIMISM – The view that micro-particles such as atoms or molecules can “act” like human beings by assigning to them powers such as recognizing, analyzing, manipulating other particles with great discrimination etc. This amounts to assigning an invisible spirit to inanimate things, just like some people assign spirits to trees, rocks or streams.

MONOTHEISM – The belief that there is one God.

MORPHOGENESIS – The appearance of form in living beings, such as we see after the fertilization of an egg cell.

MYTHOLOGY – The telling of stories that did not really happen. The belief in such stories. The body of such stories believed by some tribe or society.

NON-COVALENT BOND – A chemical bond between atoms in which they share electronic orbits. Such bonds can come about rapidly at low temperatures and can be quite stable, in contrast to non-covalent bonds such as occur between an enzyme and its substrate.

NIHILISM – Total rejection of all religious or moral principles.

NOUS – Greek for mind, intellect, thinking.

NUCLEOTIDE – Molecule that with many other similar ones makes up the poly-nucleotide string in a DNA or RNA molecule. It consists of a sugar, a phosphate group and a nitrogen base.

NUCLEUS – The most obvious organ we find in most living cells. It usually contains the DNA material through which the cell transmits its characteristics to its offspring.

ORGANELLE – A functional part of the cell, like an organ in larger living beings.

ORGANICISM – The doctrine that organic structure is merely the result of the inherent property of matter to adapt itself to changing circumstances.

PARADIGM – Lit. pattern, example, model. Introduced by Th. Kuhn as a guiding principle or even metaphysical view, shared by scientists on which to base their theories. Because it has taken on so many different meanings, Kuhn has abandoned its use, but it is still quite popular.

PETITIO PRINCIPII – A begging the question. It is a logical fallacy in which the premise of starting point already states the conclusion in slightly different form.

PHLOGISTON – A hypothetical substance or principle of “inflammability” in combustible bodies. This speculative theory was abandoned when burning was shown to consist of oxygenation.

POLYNUCLEOTIDE – A long molecule consisting of a string of nucleotides. See nucleotides and DNA.

POLYPEPTIDE – A single long chain of amino acid molecules joined by peptide linkages. Protein molecules contain them.

RELAY SWITCH – An electrical switch which in turn is itself operated by another and often much weaker current.

RETICULUM – The system of membranes which divides the protoplasm outside the nucleus into compartments. On the surface of these membranes lie the ribosomes. See next item.

RIBOSOMES – Each cell carries these small organelles on the surface of its membranes. In the ribosomes the cell makes its proteins and other complex molecules. One cell can have millions of them.

RNA – RIBO-NUCLEIC ACID – There are three types: messenger-, transfer- and ribosomal RNA. They are involved in the process whereby the cell makes a copy of a gene on the DNA molecule, transports it to the ribosome, and then makes the corresponding protein molecule there.

SPONTANEOUS GENERATION – The belief that some living beings arise spontaneously from organic matter, mud etc. This belief prevailed before the invention of the microscope and other means by which we may now demonstrate the real propagation of such species.

SUBSTANCE – In philosophy: an assumed something, invisible, which guarantees visible things their permanence throughout their changes which we can see in time. It is often ascribed an independent being and may even be held responsible for the origin of that in which it “dwells.” Thus it may take on the meaning of a spirit. It is the basis of animism.

SUBSTRATE – The molecule which an enzyme converts into a different molecule.

TELEOLOGY – The doctrine of final causes. The end-product or goal of, e.g. a growing organism is seen as the cause and directive force of this process of growth.

THEOS – God.

ULTIMA RATIO – The final cause or reason for a phenomenon.

UNEQUIVOCAL – Synonymous with unambiguous. An unequivocal statement leaves no room for doubt as to its meaning.

VITALISM – The doctrine that vital phenomena are caused by an invisible “vital principle” which is inherent in living beings.

Alphabetical Bibliography

Aristotle. *History Animalium*. Translated by D'Arcy Wentworth Thompson. The Works of Aristotle, edited by W.D. Ross. Oxford: Oxford University Press. 19 .

– *Metaphysics*. Translated by W.D. Ross. Ibid.

– *De Anima*. Translated by J.A. Smith. Ibid.

Aw, S.E. *Chemical Evolution*. Singapore: Singapore U.P. 1970.

Ayala, F.J. and Th. Dobzhansky, eds. *Studies in the Philosophy of Biology*. London: Macmillan, 1974.

Bertalanffy, Ludwig von. *Problems of Life*. New York: Harper Torchbooks, Harper Brothers, 1952.

Blum, Harold. *Time's Arrow and Evolution*. New York: Harper Bros. 1955.

Clouser, Roy. *What is Religion?* Unpublished mss.

Descartes, Renee. *Discourse of the Method of rightly Conducting the Reason*. Translated by Elisabeth S. Haldane and G.R.T. Ross.

– *Meditations of First Philosophy*. Translated by Elisabeth S. Haldane and G.R.T. Ross. The Philosophical Works of Descartes. Cambridge, Cambridge University Press. 19 .

Dillon, Lawrence. S. *The Genetic Mechanisms and the Origin of Life*. New York: Plenum Press, 1978.

Dooyeweerd, Herman. *A New Critique of Theoretical Thought*. Amsterdam: H.J. Paris and Philadelphia: The Presbyterian and Reformed Publishing Co., 1953-1957.

– *Reformatie en Scholastiek in de Wijsbegeerte* (Reformation and Scholasticism in Philosophy). Franeker, T. Wever, 1949.

Dose, K. et al., eds. *The Origin of Life and Evolutionary Chemistry*. New York: Plenum Press. 1974. This work was written in honor of “the pioneering contributions of Aleksandr Ivanovich Oparin.”

Elsässer, L.S. *The Chief Abstractions in Biology*. New York: North Holland Publish. Co., distributed by American Elsevier Pub. Co., 1975. In another interesting book the same author deals with these problems from a slightly different angle: *Atom and Organism*. Princeton: Princeton U.P., 1966.

Engels, Frederick. *Dialectics of Nature*, translated by J.B.S. Haldane. New York: International Publishers, (1940), 1960.

Esper, E.A. *A History of Psychology*. Philadelphia: Saunders, 1964.

Farley, John. *The Spontaneous Generation Controversy from Descartes to Oparin*. London and Baltimore: The John Hopkins Press. (1974), 1977.

Frankl, Viktor. *Man’s Search for Meaning*. New York: Pocket Book, 1973 (Boston, Mass.: Beacon Press, 1959).

Hegel, Georg W.F. *The Philosophy of History*. Translated by J. Sibree. Published by Robert Maynard, ed. *Great Books of the Western World*. Chicago: *Encyclopedia Britannica*, 1952. vol. 46.

Kalsbeek, L. *Contours of a Christian Philosophy*. Translated by A. Sneep. Edited by Bernard and Josine Zijlstra. Toronto: Wedge Publ., 1975.

Keosian, John. *The Origin of Life*. New York; Reinhold, 1964.

Koestler, Arthur. *Janus*. London: Hutchinson, 1978.

Koestler, Arthur and Smythies. J.R., Eds., *Beyond Reductionism, The Alpbach Symposium*, London: Hutchinson, 1968.

Kuhn, Thomas, S. *The Essential Tension*. Chicago: Chicago University Press, 1977.

– *The Structure of Scientific Revolutions*. Chicago: Chicago University Press, 2nd ed. 1970.

Lakatos, Imre and Alan Musgrave, eds. *Criticism and the Growth of Knowledge*. Cambridge: Cambridge University Press (1970) 1981.

Lever, Jan. *Creation and Evolution*. Grand Rapids: Internat. Publications, 1958.

Mayr, Ernst. *Evolution and the Diversity of Life*. Cambridge, Mass., London: The Belknap Press and Harvard University Press, 1976.

Miller, S.L. and Orgel, *The Origins of Life and Evolutionary Chemistry*. Engelwood Cliffs, N.J.: Prentice Hall, 1974.

Monod, Jacques. *Chance and Necessity*. Translated by Austryn Wainhouse. New York: Vintage Books, Random House, 1972.

Morris, Henry. *Scientific Creationism*. San Diego: Creation Life Publish., 1974.

Oparin, Aleksandr I. *Genesis and Evolutionary Development of Life*. New York: Academic Press, 1968.

– *The Origin of Life*. Translated by S. Morgulis. New York: Dover Publ., 1938.

Oparin, A.I. and Gladilin, K.L. “Evolution of self-assembly of Probiotics.” *Biosystems* 12, nos. 3 and 4.

Parker, Gary. *Creation*. San Diego: Creation Life Publish. 1981.

Plato. “Phaedrus.” *The Dialogues of Plato*. Translated by Benjamin Jowett. Oxford: Oxford University Press, 19

Ponnamperuma, C. *The Origins of Life*. London: Thames and Hudson, 1972.

Reinach, S. *Orpheus, A History of Religions*. New York: Liveright Inc., 1930.

Rohlfing, D.L. and A.I. Oparin, eds. *Molecular Evolution, Prebiological and Biological*. New York: Plenum Press 1972. This work was published in honor of Sidney Fox for his contributions to the “chemistry of the origin of life.”

Sagan, Carl. *Cosmos*. New York: Random House, 1980.

Stafleu, M.D. *Time and Again*. Toronto: Wedge Publ. and Bloemfontein: Sacum Beperk, 1980.

