INTRODUCTION TO
CHAPTER FIFTEEN

The discussion in the last chapter dealt mainly with the Earth's outer core, and those portions of the Earth directly adjoining it. The mantle of the Earth was introduced, and it formation lightly touched upon. This chapter will continue with a rudimentary examination of the mantle, and certain phenomenon which occur within it. Rather than discussing how the mantle was created, in this chapter, the study will examine what the mantle consists of. It appears that this mantle was formed on Day Two of the Creation week.

After exploring the mantle, the discussion will continue onward, all the way to the crust and outer surface of the Earth. It is of note that there are a number of special zones within the mantle. Each of these zones displays unique characteristics. Each of these zones has a special function in the overall operation of the Earth's geologic processes. Some of these zones appear to be part of a worldwide reservoir of basalt. It appears that the volcanos receive their load of lava from these particular zones.

As the Reader progresses in this chapter, they may begin to realize that there is more to a rock than just a hard mass of material. The chemical makeup of the various rock-types can actually be somewhat interesting. As a note to the Reader, there will be a further discussion on certain rock types, and the chemistry and other particulars of their formation, in Chapters 16, 17, 22, and 23.

Returning to this chapter, in the latter part, there is an interesting discussion on why certain volcanic vents may discharge a particular type of lava, and, why the same vent may discharge different types of lava at different times in the vent's history. Be prepared for some interesting revelations about the operation of the Earth, as God created it.

Also noted is some important evidence for the raising and lowering of landmasses. This discussion leaves the Reader with much food for thought. Truly, the level of the oceans of this world did not raise and lower to create the ancient elevated beaches which are currently found upon the various landmasses of this Earth. Instead, the writer believes, the landmasses themselves raised and lowered within the background-material of the Earth's crust.

Chapter 15: BEGINNING AT THE MANTLE

ULTIMATE TRUTH

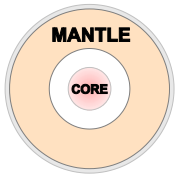
It is written: *"Silver spread into plates is brought from Tarshish, and gold from Uphaz, the work of the workman, and of the hands of the founder: blue and purple is their clothing: they are all the work of cunning men.*

"But the LORD is the true God, he is the living God, and an everlasting king: at his wrath the earth shall tremble, and the nations shall not be able to abide his indignation.

"Thus shall ye say unto the people, 'The gods that have not made the heavens and the earth, even those gods shall perish from the earth, and from under these heavens.'

"The LORD hath made the earth by his power, he hath established the world by his wisdom, and hath stretched out the heavens by his discretion."[1]

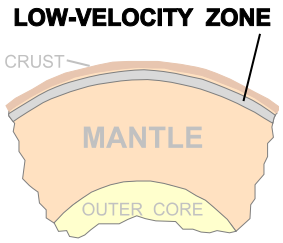
DIRECTION OF STUDY



This chapter examines from the base of the mantle, and upward, which the Lord God established by His wisdom. The general composition of the mantle is explored, as well as the built-in heat protection. This heat protection allows for the habitable part of the Earth. Also examined are a few of those superheated materials which spew forth from volcanos.

SIMPLE FACTS

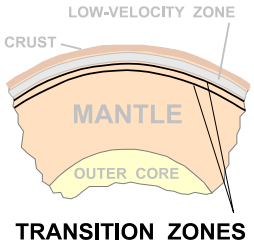
Seismic testing indicates that the mantle of the Earth is about 1,802 miles (2,900 km) thick. It generally extends from the surface of the outer core, outward, all the way to the crustal region of the Earth. As stated in the last chapter, it is believed that the mantle contains about 80 percent of the total volume of the Earth. Within this mantle can be transmitted both P and S seismic waves.[2]



In the upper region of the Earth's mantle is a 30 to 60 mile (50-100 km) thick low-velocity zone for seismic waves. This zone has a high electrical conductivity.[3] The extent of this zone is said to be from 37 to186 miles (60 to 300 km) below the crust of the Earth. It is commonly believed that this low-velocity zone represents an Earth-layer which has a greater plasticity than those mediums either above or below it in the strata of the Earth.[4] This low-velocity zone in the Earth may also include a region with less density, such as an insulating material used for heat shielding.

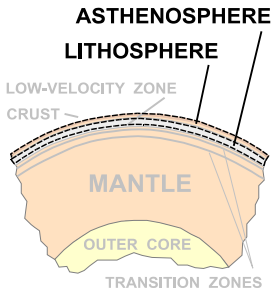
It should be noted that the top of the low-velocity zone lies deep within the Earth in those regions under the oceans. Here, it lies deeper than under the continental masses. This zone is believed to be the very base of the lithosphere. As seismic waves travel deeper into the Earth below the low-velocity zone, the waves steadily increase their velocity. This phenomenon indicates a somewhat uniform make-up of the materials in the mantle, with a steady rate of increase in compression.[5]

TRANSITION ZONES



In the mantle of the Earth is found secondary layering. There are conspicuous transition zones which appear at depths of about 220 and 400 miles (350 and 650 km) below the surface of the Earth. The scientists believe that these transition zones are caused by phase changes within the crystal lattice of the olivine which is thought to make up most of the mantle.[6 and 7] Maybe... maybe not.

TWO MORE ZONES



The scientists divide the outer shell of the Earth into two more zones. The lithosphere includes the outermost 30 to 185 mile (50 to 300 km) thickness of crust and underlying plate under the continents. Under the oceans, it is from 5 miles (8 km) thick at the spreading-centers, to about 60 miles (97 km) thick at the plate edges. The lithosphere is said to be relatively cool and somewhat rigid.[8, 9, and 10]

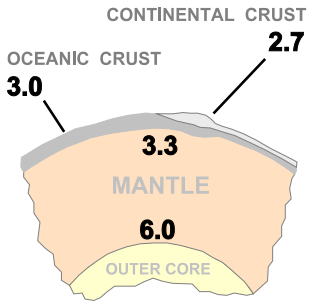
Below the lithosphere is proclaimed to lie the asthenosphere. The asthenosphere is thought to be about 60 miles (100 km) thick, with its bottom about 250 miles (400 km) below the surface of the Earth. It is said to be a zone of partial melting, with very little structural strength. The many reference books of today do not agree as to the location of the asthenosphere's bottom. Take for instance other reference sources which indicate the asthenosphere to be at a depth of 250 to 435 miles (400 to 700 km).[11, 12 and 13]

CRUSTAL DEFINITION

Before we proceed further, let us clarify the thickness of the Earth's crust. This crust is not of uniform thickness, but varies a certain amount. It is of note that the various sources also vary in the thickness which they quote for the crust. It is proclaimed that the crust under the ocean basins is relatively thin. According to various sources, this crust appears to average somewhere between 3 and 5 miles (5 and 8 km) in thickness. Under the continents the thickness of the crust appears to vary even more. The range here may be from about 6 to 47 miles (10 to 75 km) thick. On the average, it appears that the continental crust is about 25 miles (40 km) thick.[14, 15, 16, 17 and 18]

At the bottom of the crust lies the Mohorovicic discontinuity, commonly called the Moho. This seismic discontinuity, or transition zone, signals the change from crust to mantle material.[19 and 20]

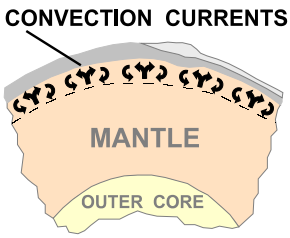
DENSITY DIFFERENTIAL



The continental crust is believed to have an average specific gravity of 2.7. The crust that forms the floors of the oceans has a specific gravity of about 3.0. The density of the thick mantle shell increases with depth, starting at about 3.3 in the upper region, down to about 6.0 at the bottom of the mantle.[21]

The difference in density among rock materials of this Earth allows the lighter weight materials to basically float on top of the heavier materials. The operation of density differential was examined earlier in Chapter 5.

HEAT FLOW



According to the scientists, there are convection currents within the outermost 300 mile (500 km) section of the mantle of this Earth. In this region, it is commonly believed that the molten granitic materials rise upward beneath the ancient rifts and mid-oceanic ridges.[22] The scientists proclaim that the process of convection currents is the driving force behind continental drift.[23] But is this the real truth, or are other forces involved?

Friend, let us stop and think for a moment. In the center of this Earth is an immense nuclear reactor which is spewing forth vast quantities of heat energy. This great heat energy should heat the liquid outer core rather evenly. This process continues the same, day and night, year after year, and millennium after millennium.

Considering the above information, according to the standard nature of convection currents, there should be vast quantities of lava continually spewing forth along all major rift lines. If this is the mechanism which truly drives sea-floor spreading, then it would seem that the continents should be rapidly moving across the oceans, even today, as they were in former times.

A NOTE

The true nature of the powerful processes which motivate rapid continental drift will be examined more thoroughly in Volume Three (*Listen to the Earth: The Days of Peleg*).

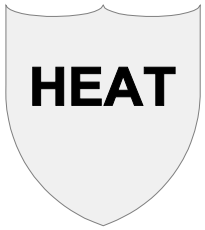
BASIC ROCK

It is believed that the mantle of this Earth is made up of rocks such as ultrabasic peridotite. These particular rocks are rich in olivine and pyroxene.[24] Most olivines are composed mainly of magnesium. Iron can also freely substitute for magnesium in these olivine rocks.[25]

When basaltic lava begins to cool, olivine is the first mineral to start crystalizing. Olivine normally reacts further with the lava to create pyroxene minerals. On other occasions, rocks of almost pure olivine are formed. These rocks are called dunites. Let us note that there are times when solid masses of olivine are shot out of volcanos as volcanic bombs.[26]

HEAT SHIELDING

The peridotite in the mantle of the Earth is often altered into serpentinite. Serpentinite is the massive form of serpentine.[27] The most fibrous form of serpentine is called asbestos. This material was commonly used in industry as an insulating material against intense heat and fire, prior to the implementation of new environmental health and safety standards.[28]



From the core of the Earth emanates vast quantities of heat. To prevent excessive heat buildup in the relatively thin crustal areas, it appears that the Lord God placed a heat shielding material in the upper part of the Earth's thick mantle. This heat protection ultimately allows the plants and animals which God created to flourish. It also helps to make an environment which is suitable for mankind. It is interesting to note that continental crust is like an insulator. It transmits heat at only half the efficiency of ocean crust.[29]

THE LOWER CRUST

At the beginning of this Earth, on the first day of Creation, there was no dry landmass to be found. The complete outer crust of the primitive 'Earth-blob' was submerged below the deep waters of the vast, extremely hot, worldwide ocean.[30] On the first day of Creation, the whole outer crust of the 'Earth-blob' was composed of only the oceanic floors.

The oceanic floors are made up of the heavier, darker igneous rocks. These rocks are most often in the form of gabbro and basalt. The rocks of the oceanic floor, as noted earlier, have an average density of approximately 3.0.[31] This allows them to float on top of the heavier mantle rock.

Chemically, basalt is the extrusive equivalent to the intrusive rock called gabbro.[32] Basalt has a fine-grained structure, whereas gabbro is of a coarse-grained nature.[33] These two igneous rocks are composed mainly of the minerals silicon and magnesium.[34]

THE BASICS

In the language of geology, the rocky materials of gabbro and basalt are referred to as basic rocks. The basic rocks are those which have less silica content than the other classes of rocks.[35]

THE MAFICS

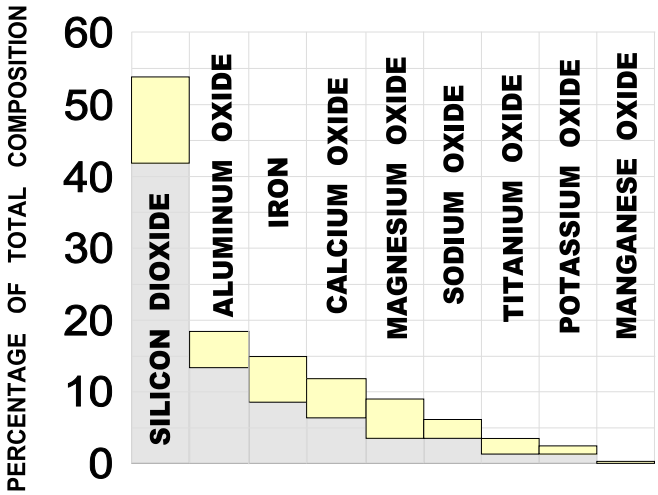
Gabbro is further defined as a coarse-grained mafic igneous rock. The coarse grain in gabbro comes from the relatively slow cooling rate of the magma, because it is insulated within the layering of the Earth. A mafic rock is defined as one with a ferromagnesian mineral content which is greater than 50 percent.[36] This ferromagnesian content is normally in the form of dark-colored silicates.[37]

Basalt is classed as a mafic rock, as are dolerite and basalt glass.[38] Dolerite is a medium-grained mafic rock with a composition similar to gabbro.[39] The medium grain-size of dolerite comes from a medium rate of magma cooling as it lies within the layering of the Earth. Volcanic glass is caused by an extremely fast rate of cooling.

BASALT

Basalt is a heavy, somewhat blackish igneous rock. It has a fine grain structure. The fine grain in basalt comes from a somewhat faster rate of cooling. The individual particles within basalt are so small that they usually cannot be seen without the aid of a magnifying lens.[40]

DRY FACTS



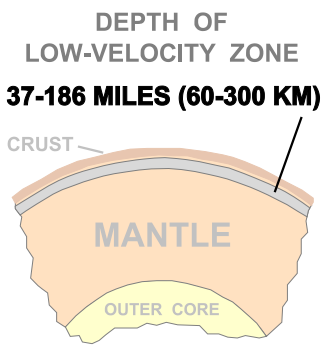
The average specimen of basalt is composed of, by weight, 42 to 54 percent silicon dioxide. The next major component is 13 to 18 percent of aluminum oxide. The other components are 8 to 15 percent of iron, 6 to 12 percent of calcium oxide, 3 to 9 percent of magnesium oxide, 3 to 6 percent of sodium oxide, 1 to 3 percent of titanium oxide, 1 to 2 percent of potassium oxide, minor amounts of manganese oxide, and traces of various other substances.[41]

SPECIALIZED BASALT

Extensive flows of basalt have originated from the floors of ocean basins. These vast volumes of basalt all appear to be of a relatively uniform composition. This phenomenon tends to cause a number of scientists to believe that there is a uniform layer of stored basaltic magma somewhere within the mantle of the Earth.[42] But there is more to the basalt story.

All basalts are not created equal. The oceanic basalts, and many of the basalts from the interior regions of continents, have a different composition than those found at the margins of the continents. Seismic studies appear to indicate that these two types of basalt originate from magma chambers which are located at two different levels within the mantle of the Earth.[43]

UPPER LEVEL



In the Aleutian Islands and Hawaii (as well as in a number of other places around the world), the silica-saturated basalt appears to extrude from magma chambers located about 37 miles (60 km) below the surface of the Earth. This is generally within the upper mantle of the Earth. It is believed that this particular level of magma chambers are those which produce the special basaltic magmas which form the floors of the oceans.[44]

Looking back to the beginning portion of this chapter, it should be noted that this 37 mile (60 km) depth for the tops of these magma chambers corresponds directly with that elevation at which is claimed to be the top of the seismic low-velocity zone, located within the upper mantle.

LOWER LEVEL

The source of the circumoceanic basalts, as found in places such as Japan, appears to lie lower in the mantle of the Earth than the source of the silica-saturated basalts. Seismic testing indicates that this circumoceanic type of lava originates at depths of approximately 62 to 75 miles below the Earth's surface (100 to 120 km).[45]

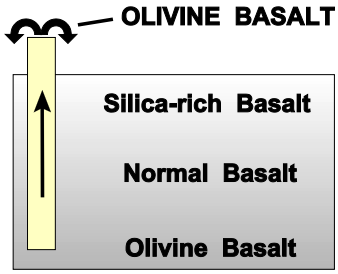
Once again, let us look to the information given at the beginning of this chapter. It appears that the source-level from which originates the circumoceanic basalts generally corresponds to the line of demarcation between the lithosphere and what is called the asthenosphere. Note that this source is located well within the low-velocity zone (see illustration above), about one-seventh of its thickness down from its top. This low-velocity zone may be a vast, pressurized reservoir of basalt.

WEIGHTY EXAMINATION

What is classed as "normal basalt" has a specific gravity of 2.87.[46] In comparison to the specific gravity of normal basalt, materials from the silica group (which includes quartz) have a specific gravity of about 2.65, or somewhat less.[47 and 48] Let us now examine the effect this weight differential would have in a common basaltic reserve.

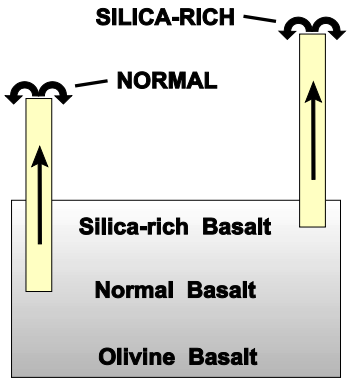
In a common repository, because of its lighter weight, any silica-rich basalt would tend to float to the upper regions of the partially molten mass. This situation is indicated in the illustration to the left. What is called olivine basalt, on the other hand, has a specific gravity of 2.95.[49] This basalt is a little heavier than normal basalt. Because of this weight differential, olivine basalt would tend to gravitate towards the lower regions of the semi-molten mix of basaltic lavas. Again, this situation is shown in the illustration to the left.

SIMPLE OBSERVATION



As noted earlier, different types of volcanic activity produce different compositions of magmas. How are these various compositions of magmas ejected from one basic magma repository? It appears that there is only one logical answer to this situation.

To have both silica-rich basalt and silica-poor olivine basalt extruding from the same basic repository would tend to indicate that the various lavas are being drawn from different levels within this semi-molten reservoir.



For a volcano to produce an olivine-type of basalt, this volcano would have to draw its molten load of magma from a deeper level in the vast magma chamber (see upper illustration at left).

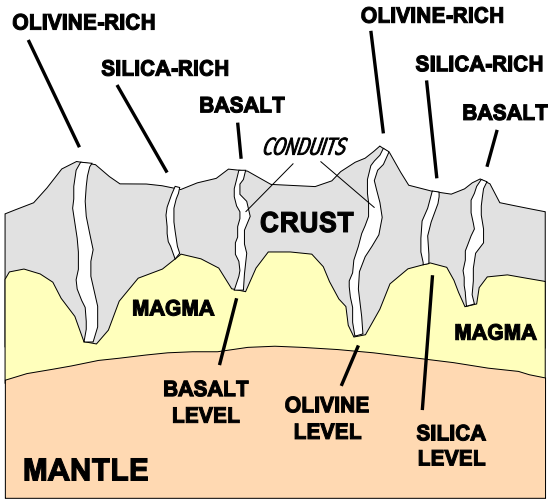
For a volcano to spew forth basalt of normal composition, this volcano would have to draw its molten load from the mid-level in the vast repository. For a silica-rich basalt to be discharged, a volcano would tap into the upper level of the semi-molten pool (see lower illustration at left).

A DEDUCTION

In all essence, the bottom of the lithosphere must be floating lower in the vast magma repository in regions where the volcanos are producing olivine basalt. In those areas of the Earth when normal basalt has spewed forth, the bottom of the lithosphere must essentially be floating higher in the semi-molten mass. Where silica-rich basalt emerges, the lithosphere effectively floats higher yet.

UNDULATING ROOF

It appears that the roof of the worldwide magma chamber, that seismic low-velocity zone, is not smooth and level. Rather, the roof of this chamber (which is truly the bottom of the lithosphere) varies greatly. It contains large variations in elevation. This is shown in the illustration below.

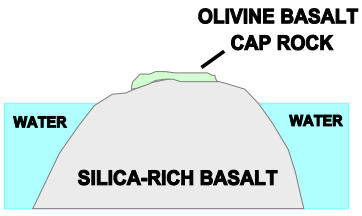


From the conduits which extend into the lower reaches of the vast magma chamber extrudes olivine-rich basalt. From the conduits extending to the midway level in the large magma chamber extrudes normal basalt.

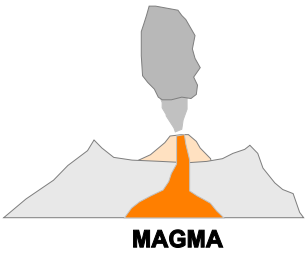
Those conduits in the lithosphere which extend only into the upper reaches of the vast, worldwide magma chamber will extrude silica-rich basalt (as in the illustration at left). It should be noted, however, that certain geologic features may differ somewhat from this very basic illustration.

There are times when the lithosphere under low-lying regions in the Earth's outer surface may, for one reason or another, protrude to the lower level of the magma chamber. In cases such as this, the volcanic conduits at these low regions may spew forth olivine-basalt, rather than silica-rich basalt.

COMPOSITIONAL CHANGES



The islands of Hawaii are composed almost entirely of silica-rich basalt. It is interesting though to note the presence of small quantities of silica-poor olivine basalt which cap these volcanic mounds. This olivine basalt is exposed in wave-cut cliffs in the higher elevations of the islands.[50] What caused this change?



Let us examine another volcano which displays a similar trait. In Italy, the volcano of Vesuvius has spewed forth lavas which are of a far different composition than those produced by ancient Mount Somma. It should be noted that Vesuvius resides directly in the ancient caldera of Mount Somma.[51] Friend, truly, what causes these changes in magmatic composition, even at one given volcanic locality?

FIRST ANSWER

In answer to the above question, let us look at a particular phenomenon which has occurred in the Pacific Ocean. In Hawaii, the main island building stage appears to have taken place from a conduit leading to the upper, silica-rich reaches of the worldwide magma chamber. Later, something caused these islands to sink partially into the Earth.

As the islands sank, the bottom of the volcanic conduit was lowered into the olivine-rich region of the magma chamber below. At that time, the cap rock of olivine basalt was extruded onto the islands. As a note, the atolls in the Pacific Ocean attest to the sinking of other volcanic islands which formerly existed.[52]

At a later date still, the islands of Hawaii were raised up to their present elevations. During this process, the former ocean-level, wave-cut, olivine basalt was raised high into the air. There is clear evidence that many islands in the Pacific Ocean have raised as much as 1,500 feet (457 m) above sea level.[53]

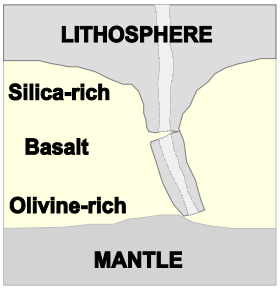
RISING LAND

Along the coast of California are found wave-cut benches more than 1,400 feet (427 m) above the existing sea level.[54] Friend, all the evidence indicates that the landmasses have raised and lowered within the foundational layers of this Earth. This subject will be discussed in more detail in Volume Two (*Listen to the Earth: From Adam Thru Noah*).

ANOTHER ANSWER

In Italy, at the ancient Temple of Serapis, there is clear evidence that the landmass near Mount Vesuvius sunk under the waters of the Mediterranean Sea in the past. At a later date, this same landmass was raised up partially out of the water, but not to its full, former elevation.[55 and 56] Observable features indicate that this phenomenon of sinking, and raising again, is a major factor in deciding from which level in the magma chamber a volcano is fed. An alteration in the conduit system feeding a volcano may also change the level from which a volcano draws its molten load.

POTENTIAL CHANGES



To the left is a graphic illustration of an event which could cause the composition of a volcano's magma to change. If the bottom of the feeder conduit is broken off (or melted away), this will cause the delivery of magma from a higher level in the chamber. On the other hand, if a former, higher elevation leak in the side of a conduit becomes plugged, this conduit may once again use its full length. It will now be able to feed from the lower reaches of the magma chamber.

A QUICK NOTE

In this chapter, the subject has been breached concerning the raising and lowering of landmasses. This is a very important process in the history of the Earth. The process by which continental landmasses rise and fall is discussed in more detail later, in Chapter 24.

THE BASIC BALL

When God the Father and His beloved Son, the Lord Jesus Christ, had finished making the basic ball of this Earth, it was a magnificent piece of advanced engineering. It had a massive, and fully automated nuclear reactor at its core. It had highly advanced control-units built directly into the layering of the Earth. These electronic "brains" control all the electrical and magnetic functions by which this Earth operates. But, be assured, God was not finished yet.

ONLY THE BEGINNING

All of the advanced systems which had been created within the Earth, as discussed so far, were simply the foundation for the remainder of God's Creation. God spent all of this time creating a special environment for the unique clay vessels in which He would be able to dwell. Friend, this is truly what God intended: to dwell in us! The following passage of Holy Scripture alludes to this fact.

It is written: *"Be ye not unequally yoked together with unbelievers: for what fellowship hath righteousness with unrighteousness? And what communion hath light with darkness? And what concord hath Christ with Belial? Or what part hath he that believeth with an infidel? And what agreement hath the temple of God with idols? For ye are the temple of the living God; as God hath said, 'I will dwell in them, and walk in them; and I will be their God, and they shall be my people.*

"'Wherefore come out from among them, and be ye separate, saith the Lord, and touch not the unclean thing; and I will receive you, and will be a Father unto you, and ye shall be my sons and daughters,' saith the Lord Almighty."[57]

THE INVITATION

Friend, will you reach out and take hold of the invitation of God? Will you become that which God intended for you: to be the very temple of the living God? Have you properly prepared your temple to be an abiding place for God the Father, and His dear Son, our Lord and Savior Jesus Christ? What must be the characteristics of that temple in which God will come to dwell?

In answer, it is written: *"For thus saith the high and lofty One that inhabiteth eternity, whose name is Holy; I dwell in the high and holy place, with him also that is of a contrite and humble spirit, to revive the spirit of the humble, and to revive the heart of the contrite ones."*[58]

The Lord Jesus Christ proclaims: *"I am the way, the truth, and the life: no man cometh unto the Father, but by me."*[59] *"Come unto me, all ye that labour and are heavy laden, and I will give you rest. Take my yoke upon you, and learn of me; for I am meek and lowly in heart: and ye shall find rest unto your souls. For my yoke is easy, and my burden is light."*[60] And again: *"Behold, I stand at the door, and knock: if any man hear my voice, and open the door, I will come in to him, and will sup with him, and he with me."*[61] Friend, the Master calls you!

A CHOSEN VESSEL

The apostle Paul writes: *"What? Know ye not that your body is the temple of the Holy Ghost which is in you, which ye have of God, and ye are not your own? For ye are bought with a price: therefore glorify God in your body, and in your spirit, which are God's."*[62]

Friend, are you beginning to understand your true purpose on this Earth? May you look to the true Spirit of God, that Spirit which is found throughout the complete Word of God. Once you have found that true Spirit of God, may you then willingly obey the Spirit and Word of God in all things. May you ultimately become all that God meant for you to be! May you ultimately become one with God![63]

Friend, so ends another Chapter in this FIRST EDITION of

Listen To The Earth, Volume One, THE CREATION, by **David E. Sakrisson and Friends**

in 34 Chapters, plus README, Preview, Start, and End files

with References following each Chapter

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10. *Plate Tectonics: Unraveling the Mysteries of the Earth*, Jon Erickson, 1992, page 57.

11. *The Story of the Earth*, Cattermole and Moore, 1985, page 43.

12. *The 1998 Grolier Multimedia Encyclopedia*, "Earth, structure and composition of;" and "Earth, Heat Flow In."

13. *Mantle Plumes and Their Record in Earth History*, Kent C. Condie, 2001, page 4.

14. *Plate Tectonics: Unraveling the Mysteries of the Earth*, Jon Erickson, 1992, page 55.

15. *Mantle Plumes and Their Record in Earth History*, Kent C. Condie, 2001, page 4.

16. *Physical Geology*, Longwell/Flint/Sanders, 1969, page 443.

17. *The Story of the Earth*, Cattermole and Moore, 1985, page 56.

18. *The 1998 Grolier Multimedia Encyclopedia*, "Mantle."

19. *The 1998 Grolier Multimedia Encyclopedia*, "Mantle."

20. *Mantle Plumes and Their Record in Earth History*, Kent C. Condie, 2001, page 3.

21. *Microsoft Encarta 98 Encyclopedia*, "Earth."

22. *The 1998 Grolier Multimedia Encyclopedia*, "Plate Tectonics."

23. *Microsoft Encarta 98 Encyclopedia*, "Earth." Let us further consider this matter of upper-mantle convection currents being the driving force behind plate tectonics. An article in the March 4, 1995, issue of *Science News* (called "Deep heat unites the volcanoes of Europe," by Richard Monasterky, on page 134) indicates that there are hot rock materials which are rising up through the Earth's mantle. If these materials are rising through the mantle, this would indicate that the driving heat-force (and possibly the materials also) originate from below the level of the mantle. According to the article, if this is the case, scientists may be forced to revise their theories about plate tectonics.

24. *The 1998 Grolier Multimedia Encyclopedia*, "Mantle."

25. *The 1998 Grolier Multimedia Encyclopedia*, "Olivine."

26. *The 1998 Grolier Multimedia Encyclopedia*, "Olivine."

27. *The 1998 Grolier Multimedia Encyclopedia*, "Peridotite."

28. *The 1998 Grolier Multimedia Encyclopedia*, "Serpentine."

29. *Plate Tectonics: Unraveling the Mysteries of the Earth*, Jon Erickson, 1992, page 51.

30. See: *The Holy Bible*, Book of Genesis, chapter 1, verses 1-10.

31. *Microsoft Encarta 98 Encyclopedia*, "Earth."

32. *Microsoft Encarta 98 Encyclopedia*, "Basalt."

33. *The Larousse Guide to Minerals, Rocks, and Fossils*, Hamilton/Woolley/Bishop, 1982 Edition, page 147.

34. *Microsoft Encarta 98 Encyclopedia*, "Plate Tectonics."

35. *Minerals of the World*, Charles A. Sorrell, 1973, page 9.

36. *Physical Geology*, Longwell/Flint/Sanders, 1969, page 650 and 653.

37. *Physical Geology*, Longwell/Flint/Sanders, 1969, page 619.

38. *Physical Geology*, Longwell/Flint/Sanders, 1969, page 620.

39. *Physical Geology*, Longwell/Flint/Sanders, 1969, page 621.

40. *Physical Geology*, Longwell/Flint/Sanders, 1969, page 9.

41. *The 1998 Grolier Multimedia Encyclopedia*, "Basalt."

42. *Physical Geology*, Longwell/Flint/Sanders, 1969, pages 509-510.

43. *Physical Geology*, Longwell/Flint/Sanders, 1969, pages 509-510.

44. *Physical Geology*, Longwell/Flint/Sanders, 1969, pages 466, 509-510.

45. *Physical Geology*, Longwell/Flint/Sanders, 1969, page 510.

46. See: *Physical Geology*, Longwell/Flint/Sanders, 1969, page 622.

47. *Minerals of the World*, Charles A. Sorrell, 1973, page 206.

48. See: *The Larousse Guide to Minerals, Rocks, and Fossils*, Hamilton/Woolley/Bishop, 1982 Edition, pages 128-132.

49. See: *Physical Geology*, Longwell/Flint/Sanders, 1969, page 622.

50. *Physical Geology*, Longwell/Flint/Sanders, 1969, page 466.

51. *Physical Geology*, Longwell/Flint/Sanders, 1969, page 458.

52. See: *Physical Geology*, Longwell/Flint/Sanders, 1969, page 565.

53. *The Flood*, Alfred M. Rehwinkel, 1951, page 121.

54. *Physical Geology*, Longwell/Flint/Sanders, 1969, page 403.

55. *Physical Geology*, Longwell/Flint/Sanders, 1969, text and illustration, pages 401-402.

56. *Volcanoes of the Earth*, Fred M. Bullard, 1984 Edition, page 383.

57. *The Holy Bible*, Book of II Corinthians, chapter 6, verses 14-18.

58. *The Holy Bible*, Book of Isaiah, chapter 57, verse 15.

59. *The Holy Bible*, Book of John, chapter 14, verse 6.

60. *The Holy Bible*, Book of Matthew, chapter 11, verses 28-30.

61. *The Holy Bible*, Book of Revelation, chapter 3, verse 20.

62. *The Holy Bible*, Book of I Corinthians, chapter 6, verses 19-20.

63. See: *The Holy Bible*, Book of John, chapter 17, verses 20-23.