New Early Eighth-century B.C. Earthquake Evidence at Tel Gezer: Archaeological, Geological, and Literary Indications and Correlations

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New early eighth-century B.C. earthquake evidence at Tel Gezer: Archaeological, geological, and literary indications and correlations

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Andrews University, 1992
NEW EARLY EIGHTH-CENTURY B.C. EARTHQUAKE EVIDENCE AT TEL GEZER: ARCHAEOLOGICAL, GEOLOGICAL, AND LITERARY INDICATIONS AND CORRELATIONS

A thesis
presented in partial fulfillment of the requirements for the degree Master of Arts

by

Michael Gerald Hasel

APPROVAL BY THE COMMITTEE:

[Signatures]

[Names]

5/7/92

Date approved

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ABSTRACT

NEW EARLY EIGHTH-CENTURY B.C. EARTHQUAKE EVIDENCE AT TEL GEZER: ARCHAEOLOGICAL, GEOLOGICAL, AND LITERARY INDICATIONS AND CORRELATIONS

by

Michael Gerald Hasel

Adviser: Randall W. Younker
ABSTRACT OF GRADUATE STUDENT RESEARCH

Thesis

Andrews University
Seventh-day Adventist Theological Seminary

Title: NEW EARLY EIGHTH-CENTURY B.C. EARTHQUAKE EVIDENCE AT TEL GEZER: ARCHAEOLOGICAL, GEOLOGICAL, AND LITERARY INDICATIONS AND CORRELATIONS

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Date completed: June 1992

The 1990 season of excavation at Tel Gezer, Israel yielded for the first time evidence for an earthquake during the middle of the eighth century B.C. This new evidence is described and correlated with other archaeological sites in Israel of the same time period as well as larger geological contexts of past and present seismic activity in that region. This correlation provides prime new data about the potential timing of the earthquake, its extent, and significance.

Literary support for a major earthquake is also investigated which indicates an earthquake during this general time period. A textual study of pertinent passages from the Hebrew Bible and chronological data from biblical and extra-biblical sources are brought into relation with the
archaeoseismic evidence. These archaeological, geological, and literary evidences are correlates for a suggested earthquake paradigm.
To my parents
Gerhard and Hilde Hasel
for their loving support and
guidance throughout these years.
Their lives have become the
inspiration for a future
generation
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Professor William Dever of the University of Arizona, who directed the Tel Gezer Excavations, provided forthcoming articles and other materials that greatly benefitted this research. Professor Iaakov Karcz of the Geological Survey of Israel provided me with valuable geological information during my personal contact with him in Jerusalem the summer of 1991.

I would like to acknowledge the American Schools of Oriental Research and the Endowment for Biblical Research in providing a Summer Travel Scholarship for my participation in the 1990 archaeological season at Tel Gezer.

There are a number of other people who have rendered significant support in a variety of ways. Some of them do not wish to be mentioned, but my gratitude and profound appreciation cannot be expressed by words.

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CHAPTER I

INTRODUCTION

In the summer of 1990 an archaeological excavation at Tel Gezer unexpectedly revealed evidence for an earthquake from the first half of the eighth century B.C. This discovery is the subject of this thesis within the larger archaeological, geological, and literary contexts. These contexts provide essentials for an earthquake paradigm proposal.

Statement of the Problem and Methodology

Earthquake destruction features have appeared at various ancient sites in Israel from the eighth century B.C., including the recent discovery of the Tel Gezer earthquake. Some excavators have had a difficult time interpreting certain destruction features. Archaeologists have largely interpreted them on the basis of a warfare paradigm or other cultural processes. However, as evidence pointing to seismic activity increases, there is a distinct need to engage in an investigation of the types of features associated with natural environmental processes such as earthquakes. An integrated approach is not yet available, causing potential difficulties in the interpretation of data. In harmony with the interests
of an interdisciplinary approach of the "new archaeology," Syro-Palestinian archaeology would be greatly benefitted by an earthquake paradigm taken from an analysis of phenomena relating to the areas of archaeology, seismology, and literary study.

The problem is intensified because there is also literary evidence in the Hebrew Bible for an earthquake assigned to the same general period of time. The superscription of the book of Amos states that the visions received by the prophet Amos came "two years before the earthquake" (Amos 1:1). This earthquake was of such importance that it was even mentioned about two centuries later by the prophet Zechariah (14:5).

Some archaeologists have used the dating of the earthquake in the book of Amos for the dating of apparent earthquake destruction at their site (cf. Yadin et al. 1960). Later commentators of the book of Amos have turned to Yadin's excavations at Hazor and the date he assigned to the earthquake to date the book of Amos. Thus there is here a problem of circular argumentation. This issue calls for a methodology that will allow the archaeoseismic evidence to be investigated on its own terms and in its own setting. The same holds true for the literary data from the Hebrew Bible.

The archaeoseismic features are related to and brought about by geological changes and conditions. This third arena of information from geology has been used sparsely in
interpretation. There is a need of extensive exploration and development.

A sound methodology that is sensitive to and gives full value to various contexts--cultural, environmental, and literary--is expected to correlate archaeoseismic, cultural, and literary features and their interpretations.

The problem at present is that there is no earthquake paradigm known for Syro-Palestinian archaeology or elsewhere. This thesis argues for an interdisciplinary methodology that is integrative in purpose. This integrative methodology seems essential for our proposed earthquake paradigm.

**Purpose of the Study**

The major purpose of this study was to investigate the recently discovered earthquake at Tel Gezer at the 1990 excavation season (in which I participated) and to relate it to its larger context. A part of this investigation was (1) to describe, evaluate and interpret the archaeological evidence for the eighth century earthquake at Tel Gezer; (2) to describe and evaluate possible eighth century earthquake evidence in archaeological sites contemporary with the Tel Gezer discovery; (3) to investigate geological evidence for seismicity in Israel and to show how this relates to the earthquake under discussion; (4) to study the literary materials pertaining to the eighth-century earthquake in biblical and extra-biblical literature; and (5) to define basic characteristics essential for a proposal of an
earthquake paradigm for archaeology based both on the cumulative results derived from the investigations in each of the chapters of this thesis (archaeological, geological, and literary), and from scholars who have addressed the issues of archaeoseismicity.

Limitations of the Study

This investigation was limited to a study of archaeoseismicity and literary data related to the eighth century B.C. earthquake. It would have been far beyond the scope of this thesis to investigate earthquake evidence on a grand scale in Israel and Jordan or in Near Eastern archaeology as a whole. Neither did this study seek to include descriptions of seismic activity in other parts of the world. However, this study was intended to investigate various key elements related to archaeoseismicity and to provide an integrative earthquake paradigm that may be universally applicable.
CHAPTER II

ARCHAEOLOGICAL EVIDENCE OF THE
TEL GEZER EARTHQUAKE

Tel Gezer is identified with the site of ancient Gezer of the Hebrew Bible (Josh 10:33; 12:12; 16:3; 21:21; Judg 1:29; 1 Kgs 9:15, 16, 17; 1 Chr 6:67; 7:28; 20:4). It functioned as one of the largest and most strategically placed cities in ancient Palestine.

Tel Gezer was occupied from the late fourth millennium B.C. into the Roman period. The site is located approximately five miles south of modern Ramle. Ancient Gezer has an elevation of about 225 meters above sea level. It is located on the last foothills of the Central Ridge that slopes down to meet the northern Shephelah (Dever; Lance; Wright 1970: 1; see Plate 1).

The tel is oriented in an east-west direction. It is about 650 meters long and 200-250 meters wide. Its area consists of ca. 30 acres (cf. Dever; Lance; Wright 1970: 1-14; see Plate 2).

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Tel Gezer was first excavated by R. A. S. Macalister between 1902 and 1909 for the Palestine Exploration Fund. Later excavations were conducted from 1964-1971 under the
direction of William G. Dever, sponsored both by the Hebrew Union College -- Nelson Glueck School of Biblical Archaeology and the Harvard Semitic Museum.

Phase II of the Gezer excavations began in 1972 with Joe D. Seger serving as director of the project. The excavation of Phase II ended in 1974. One decade later, in the year 1984, William G. Dever returned to direct what was thought to be the final season of excavation at Tel Gezer in order to clarify questions concerning the Solomonic Gate and the "Outer Wall" (Dever 1984). Ensuing questions made it necessary for yet another season during the summer of 1990. I was a participant in the 1990 season, serving as an excavator in Area 22, one of the squares in which earthquake evidences seem to have been discovered.

Earthquake Evidence

The most recent archaeological season at Gezer, during the summer of 1990, was sponsored as a Joint Project of Andrews University, the University of Arizona, and Hebrew Union College -- Jewish Institute of Religion.

This season was very productive. It provided new evidence for the disputed dating of the Solomonic Gate and "Outer Wall" of the city of Gezer during the Late Bronze and Iron Ages, a debate that has been a deepening controversy for over a decade.¹

During this recent excavation, while uncovering the "Outer Wall," unexpected and unforeseen new evidence came to
light in Field XI, Areas 20, 21, and 222 which suggested that a destruction caused by earthquake activity took place in the eighth century B.C.

Area 20

It is necessary to describe certain new discoveries and insights gained in the 1990 season as they relate to the discovery of earthquake activity.

In Field XI attempts had been made throughout this season to locate the Iron Age towers in the LB wall Macalister had described in his excavation reports and plans (1912) (see Plate 2).

Attention was focused on "Tower VII" which according to Macalister's plan was located directly north of the "Egyptian Governor's Residence" (Younker 1991: 25; see Plate 2). Several ashlar blocks were discovered. They yielded one corner which turned out to be no tower at all but rather an offset in the wall. Based on these findings, it was concluded that Macalister had probably found only the offset and drawn in the rest of the "Tower VII" without checking with further excavation. Now it is clear that there was no tower.

With the hope of finding a genuine Solomonic tower, the excavators decided to move east approximately 25-30 meters along the "Outer Wall" (Younker 1991: 27). This is where Area 20 was opened. It yielded a corner of what Macalister had called "Tower VI." Excavations indicated that this was a corner of an offset-inset wall as well (Dever in press a).
It was concluded that "sometime during the 9th/8th century B.C. the upper courses of the 'Outer Wall' were remodelled with large ashlars to create an offset" (Younker 1991: 28). The date for this ashlar insert was determined from the pottery that was found in its foundation trench (see Plate 3).

These offsets and the wall seem to have been destroyed sometime during the middle of the eighth century B.C. (Younker 1991: 28). The question is the etiology of this destruction.

There are several lines of evidence that suggest that this destruction was caused by an earthquake. For example, in Area 20 there were fissures that penetrated through all three courses of ashlars (Dever in press a; Plate 3). Secondly, the ashlar blocks above the foundation stones were moved laterally from their foundational stones by several inches. Thirdly, the foundation cornerstone itself had been cracked and is broken in two.

It seems evident that massive pressure and/or movement was needed to create these combined characteristics. It does not seem possible that slow subsidence due to poor construction, or soil composition, is responsible for the movement because the foundation stones rest solidly in the bedrock which was cut several inches deep. The tower rested directly on the cut bedrock and the construction of its wall was solid. Furthermore, the ashlars themselves were of considerable size and thus could only be moved by considerable
force. Generally speaking the building technique used by the original builders was sound.

It has been suggested that only a sudden lateral movement would explain why the foundational cornerstone might be split in two as well as the fissures through several courses of the three layers of ashlars above. The reason that the cornerstone itself was not dislodged from its foundations was probably "due to the fact that they were set into levelled-out depressions cut directly into bedrock" (Younker 1991: 29).

The "Outer Wall" Between Area 20 and 21

Excavations continued during this season east of Area 20 in an attempt to uncover more of the "Outer Wall." As the surface of that wall was exposed new evidence was uncovered. A length of about 30 meters was exposed towards the east. It revealed that the wall was significantly tilted toward the north (see Plate 3).

In this intersection between Areas 20 and 21 the "Outer Wall" was approximately 2 meters wide. It had been constructed of sizable ashlar masonry. This wall was not excavated to its foundations at this intersection. However, it is hardly possible to suggest that this outward tilting of the wall at an angle of about 15 degrees was caused by poor foundations and resultant subsidence. The tilting rather suggests that it is caused by a massive earthquake. This is supported by a large number of masonry stones from the upper
course(s) of the wall which had fallen backward into the area opposite of the direction of the tilting where such stones would normally fall if the tilting was caused by slow subsidence (Younker 1991: 28). Randall Younker, co-director of the excavation, writes:

[that] this tilting [of the wall] was not due to slow subsidence over a long period of time was evident by the large number of stones that had fallen off the upper courses of the wall backwards into the city. Only a very rapid outward tilting of the wall, such as that caused by an earthquake, could cause these upper stones to roll off backwards, away from the tilt. If the wall had tilted outward slowly, the stones on the top of the wall would be expected to gradually fall off towards the downward sloping outer face of the wall (1991: 28).

This rapid outward tilt must have been caused by a natural geophysical activity, (i.e., an earthquake as Younker suggests). Furthermore, a wall of such large proportions seems unlikely to have been tilted by the battering ram in a military assault or some other human effort (Dever in press a). Natural decay due to abandonment seems unlikely since the fallen stones were found along the inner face of the wall in the opposite direction where decay would have rolled them off. If slow subsidence had caused the tilting to occur one would expect the stones to have fallen again on the side of the tilt of the wall. An earthquake seems to be the best explanation for causing this tilting phenomenon and the displaced stones.

Area 22

Area 22 was opened directly opposite of Area 21 (to the north), on the outside face of the "Outer Wall" (Younker 1991:...
30). It was excavated down to bedrock and contained vital information for the dating of the "Outer Wall."

The "Outer Wall" was found to consist of three phases (see Plate 4). The first phase (Wall 22002) was originally built in the LB IIB period, sometime in the 13th century B.C. (Younker 1991: 31). During the latter part of the tenth century, Wall 22000 was built on top of Wall 22002 using it as a foundation. The rebuilt wall was out of line with the lower LB II wall (22002) by ca. 64 cm. This wall remained in use until the late ninth/early tenth century B.C. along with the third phase (Wall 21000) when it was replastered.

The later "Outer Wall" in Field XI, Area 22, severely "tilted outward at an angle of ca. 10-15 degrees" (Dever in press a), towards the north as was already seen from along the top of the wall and from Area 21. At the place where the tilting seemed to have begun, the face of the wall as well as the sloping base was replastered. This replastering followed precisely the contours of the tilting wall, suggesting that the wall may have been replastered directly following the earthquake.

Stratigraphic and Ceramic Dating of the Earthquake

The dating of the earthquake at Gezer has been primarily established by ceramic and stratigraphic evidence from Areas 20 and 22.

In Area 20 the dating for the ashlar insert and the
upper courses was determined by the ninth/eighth century pottery in their foundation trenches as well as the style of the ashlars themselves.

In Area 22, where the entire outer face of the "Outer Wall" was uncovered to bedrock, the upper portion of the wall also clearly tilted outward. Immediately after the wall had been tilted, its outer face was replastered down to where ground level was at the time and the plastering continued outward and down the slope. It was probably put there to prevent water from undercutting any further the already tilting wall. The plaster clearly conformed to the outward sag of the wall. This indicated that it had been placed there after the tilting occurred, or more precisely after the earthquake. The "pottery both above and below the plaster at ground level clearly dated the replastering [of the wall] to the mid-eighth century B.C." (Younker in press). This would seem to indicate that the earthquake took place slightly before the replastering occurred, (i.e., slightly before 750 B.C.).

Other Dating Correlations

Attempting to establish a more precise historical date, William G. Dever, director of the excavation, uses the chronology of J. H. Hayes and J. Hooker (see below) to establish that the earthquake struck sometime between Uzziah's reign from ca. 786-744 B.C. and Jeroboam's reign from ca. 786-746 B.C. (Dever in press a). Dever further suggests that,
The precise calculation of ca. 760 B.C. depends upon the assumption, derived from Rabbinic sources and Josephus, that the earthquake occurred at the time Uzziah contracted leprosy, which in turn could theoretically be connected with the time when the latter began his coregency with Jotham (Dever in press a). This theory will be discussed below when dealing with the literary evidence of the Biblical text and Josephus (see chapter 5).

Summary

From the complete assessment of the features found in Field XI, it can be concluded that an earthquake caused the destruction of the site sometime in the first half of the eighth century B.C. Evidence that these features were not due to other geomorphological and geotechnical factors have been outlined as follows:

(1) In Area 20 the foundation stone upon which the ashlars rested was placed in the cut bedrock. The ashlars on top of the foundation stone were offset and cracked through several courses. The foundation stone itself was cracked. Since it is sitting directly on bedrock, this could not have been a case of slow subsidence or poor soil conditions.

(2) The "Outer Wall" between Area 20 and 21 revealed stones from the "Outer Wall" that had fallen toward the inside of the wall. This would seem to indicate that the wall experienced a sudden movement lurching the stones in the opposite direction of the movement, in this case to the inside of the "Outer Wall." Slow subsidence over time would have
caused the stones to fall with gravity along with the outward leaning of the wall and down the slope. Subsidence cannot be the case at Gezer. Furthermore, the wall was leaning both north and south in an alternate manner for a length of ca. 30 meters. Since the wall was nearly 2 meters wide in some places and constructed of fine, ashlar masonry, it would seem unlikely that a human element caused such a phenomenon. Neither would it seem likely that this was caused by slow subsidence or other geotechnical factors, for the wall itself was built on bedrock.

(3) In Area 22 evidence for the earthquake consisted of two main elements, the tilting of the wall outward at about 10-15 degrees and the replastering of the wall at the point where the tilting occurred. The replastering provides evidence for dating as well as evidence for immediate reconstruction and rebuilding.

These factors together would seem to indicate that a major earthquake affected the site during the first half of the eighth century B.C. An earthquake of this proportion may have affected various contemporary sites. It is with this purpose that we now examine possible seismic evidence at other sites in Israel looking for possible correlations and parallels.
NOTES

1. The debate regarding the dating of the Solomonic Gate and "Outer Wall" basically originates from two perspectives. One maintains that the "Outer Wall" and Gate were refortified by Solomon during the tenth century B.C. as based on the stratigraphical evidence. The other maintains that the rebuilding took place later and was brought about by Ahab during the ninth century B.C. as is reflected by the architectural evidence. For a discussion in defense of the architectural approach, see Aharoni 1973; Bunimovitz 1983; Finkelstein 1981; 1988; 1990; Stern 1987; Ussishkin 1980; 1990; Zertal 1981. For a discussion of the stratigraphic approach, see Dever 1973; 1977; 1981; 1982; 1984; 1985; 1986; 1989; Dever; Lance; Wright 1970; Dever et al. 1971; 1974; Holladay 1990; Stager 1990. The final season of excavation at Gezer (1990) provided sound evidence for an earlier tenth century date for the rebuilding of the "Outer Wall" and Gate area of Gezer. See Dever in press b; Dever and Younker in press; Younker 1991.

2. Younker (1991) used the terminology "Squares" when referring to the soundings in Field XI while Dever refers to the same soundings as "Areas". The two terms for the excavations at Gezer are used interchangeably.
In order to determine the extent of the eighth-century B.C. earthquake at Tel Gezer it was necessary to locate other contemporary sites with earthquake evidence. Numerous sites had shown earthquake activity during the Iron II period. Some sites had been interpreted by the excavators themselves to contain such evidence, while others indirectly reflected the possibility of seismic activity during the period in question. For the latter we could only analyze the evidence available and make tentative suggestions and conclusions.

This aspect of the study was limited by several factors:

1. It remains uncertain whether some excavators had a clear understanding of what constituted evidence for seismic destruction (see chapter 4).

2. Some excavators have not provided detailed ceramic analysis in connection with their conclusions for seismic destruction, making the dating of the earthquake evidence at these sites difficult (Hazor, Lachish, Tel 'Erany).
3. Oftentimes the literary evidence was paralleled with the archaeological evidence without an understanding of the geological conditions and contexts.

4. In some cases (Lachish, Tel 'Erany, Arad) final reports of the excavations have not been published for complete analysis.

Nevertheless, the evidence that does exist from other contemporary sites is evaluated and reacted to in this chapter providing a broader context for the earthquake at Tel Gezer and a possible suggestion as to its extent.

Hazor

Earthquake Evidence

The 1960 report of the second season of excavations at Hazor, under the direction of the late Yigael Yadin, was published as *Hazor II* (Yadin et al. 1960; cf. Yadin 1957). This report provides the most conclusive and detailed evidence for an earthquake during the eighth century other than Gezer, specifically in Area A, Stratum VI, which was under the supervision of Yohanan Aharoni. The excavation report states:

Many walls in this stratum were found bent and cracked; in several places we found debris of walls lying course on course, just as found in earthquakes when the entire wall collapses at once. The direction in which the walls leant or fell was southerly or easterly, according to the direction in which they ran. In some cases the upper part of the wall collapsed and the lower part remained standing but leaning. Leaning walls were used as a foundation for Stratum V when rebuilding began (Yadin et al. 1960: 24).

Aharoni continues describing the wreckage in Room 78,
The N. wall was leaning to the S., and was partly supported by the debris that blocked the W. entrance to the room. Next to the wall was a sloping pile of debris made up of courses of stones; buried beneath it were several vessels (Yadin et al. 1960: 24).

In subsequent descriptions of Rooms 14a, 113, and 21a, "the W. wall leans sharply to the E., the E. wall less so" (Yadin et al. 1960: 24).

In room 113 the West wall was cracked and leaned eastward. The cracked wall has a correspondence at Gezer. It correlates with the cracks at Gezer which ran through several courses in Probe 20 (see above).

Yadin's conclusion that Hazor was some distance from the epicenter of the earthquake was confirmed by geologists from the Hebrew University of Jerusalem who visited the site (Yadin et al. 1960: 26). Some of the stronger walls had survived the earthquake while others were partially wrecked. Some even remained standing at an angle in places (Yadin et al. 1960: 26).

As is the case at Gezer, the evidence at Hazor also suggests that immediate reconstruction took place. According to the report, the damage done was repaired at once and the buildings were rebuilt. Some of them were rebuilt by the former inhabitants, to judge by the astonishing resemblance between Stratum VI and Stratum V, in which most of the buildings rose again with very slight changes. . . . Likewise, even in the rooms where the walls stood unaltered we found a new and raised floor, evidently built over the debris of the fallen ceilings (Yadin et al. 1960: 26).

In the most recent report, Hazor III-IV, more
indication is given for the destruction of an earthquake in Stratum VI. It is reported that the best evidence came from Building 2a, the largest residential building excavated at Hazor. After the earthquake, "its strongly built walls remained standing to a considerable height, but the earthquake is evidenced by their tilt southwards, particularly that of the three pillars" (Yadin et al. 1989: 42-44). In all the rooms large amounts of "debris comprising lumps of plaster" were found, evidently from collapsed ceilings similar to those found in Storeroom 148 in 1956 (Yadin et al. 1958: 23).

Amnon Ben-Tor resumed excavations at Hazor in 1990. This season revealed further evidence for earthquake destruction in Stratum VI, primarily in Area A where a street and drain seemed to be simply split down the center (Dever in press a).

Dating Method

In determining a date for the earthquake, Yadin notes in his more popularized report of the excavations at Hazor published in 1975, that "since the Stratum was below the stratum ascribed to Pekah son of Remaliah . . . it was easy and logical to ascribe this destruction to an earthquake, which is indeed referred to in the Bible" (Yadin 1975: 152). He concludes, "This was a fortunate discovery for us . . . for it enabled us to date this stratum absolutely to with in a few years of the one above it [Stratum V]" (Yadin 1975: 152-153).

Thus Yadin's argument for the absolute date of this
Stratum VI is as follows: "Since Stratum V ends with the great destruction of 732 B.C., and Strata VIII-VII belong to the 9th century B.C., it is clear that Stratum VI belongs to the first half of the 8th century B.C." (Yadin et al. 1960: 36). He sets the date to about 760 B.C. In another article published one year earlier he sets the destruction for this stratum at 765 B.C. (Yadin 1959: note 73).¹

There is no mention made in any of the reports as to the sequential placement of the ceramic material. It may be possible that Yadin simply saw the Biblical connection and from the textual evidence concluded that the earthquake took place in 765-760 B.C. But for him to assert such a specific date from the archaeological data is not documented and therefore remains questionable.

Tel 'Erany

Earthquake Evidence

Clear evidence seems to have been found for earthquake activity at Tel 'Erany (located several kilometers from the site of Lachish in the southern region of the country) according to its excavator S. Yeivin. Yeivin attests that in Level VI of the acropolis, "walls were uprooted and torn apart, and in a room in layer seven buried under the ruins of Stratum VI the stone-paved floor was split, its northwest section sinking some 10-15 cm. lower than the southeast section" (Yeivin 1979: 168).
Dating Method

The dating of this earthquake was based on the evidence of the "finds uncovered there" and indicate that Level VI should be dated to the mid-eighth century B.C., actually to 749 B.C. in Yeivin's dating system (Yeivin 1979: 168). Unfortunately, Yeivin died and the detailed excavation reports were never published. However, Yeivin believes that the photographs, memoranda, and plans in the files of the excavation are "clear indication" of the earthquake and its date (Yeivin 1979: 339). No mention of an earthquake was made during a brief report of subsequent excavations at Tel 'Erany (Kempinski and Gilead 1988: 88-90). Thus Yeivin's earthquake evidence from around the middle of the eighth century B.C. stands on the basis of his preliminary report.

It should be noted that Yeivin, like William Dever, utilizes for the dating of the earthquake evidence at Tel 'Erany the reference in Josephus about King Uzziah (Ant. IX, x, 4). Josephus states that the king was stricken by leprosy at the time of an earthquake ten years before his death. Yeivin dates the appearance of leprosy on Uzziah at the time of the earthquake to 749 B.C. (Yeivin 1979: 162). There remain questions regarding the methodology of dating based on Josephus and the historicity of the events he recorded (see chapter 5).
Lachish

Earthquake Evidence

Lachish, located in southern Israel's Shephelah region, has evidence for an eighth century B.C. earthquake according to its excavator David Ussishkin (1977a: 43). In Level IV of Area S, "many of the floors of the main building were covered with relatively large quantities of pottery, including both intact and broken vessels -- an indication of sudden destruction" (Ussishkin: 1977a: 43). No signs of fire were detected with the possible exception of room H.15:1010 (Ussishkin: 1977a: 51). When discussing the stratigraphical conclusions drawn for Level IV, Ussishkin states, Level IV apparently came to a sudden end, but it seems clear that this was not caused by fire. On the other hand, the lower house of Level III and the rebuilt enclosure wall followed the lines of the Level IV structures, while the Level IV city wall and gate continue to function in Level III; these facts point towards the continuation of life without a break. Considering that the fortifications remained intact, we can hardly identify this level with the city that was stormed and completely destroyed in the fierce Assyrian attack. Here we may mention M. Kochavi's suggestion (made during a visit to the excavation in 1976 and quoted here with his kind permission) that the end of Level IV structures may have been caused by an earthquake. A natural catastrophe of this sort would, perhaps, be compatible with the above findings. Of interest in this connection is the earthquake mentioned in Amos 1:1 and Zech. 14:5, which occurred about 760 B.C.E. during the reign of Uzziah, king of Judah (1977a: 52).

Ussishkin is cautious in his conclusions, yet he mentions a number of significant points that should not escape our attention. First, there is an indication of a sudden destruction. Second, the evidence for the continuation of
life without a break would correlate with the majority of sites already studied. Third, there is no evidence for fire with some exception in this destruction level. These points, each significant in itself, suggest a natural catastrophe rather than a human one of military nature (cf. Y. Aharoni 1975b; 1977; Tufnell 1953; 1959; Ussishkin 1977b).

**Dating Method**

Unfortunately Ussishkin refers only to the literary evidence in dating the possible earthquake destruction. No comparison is made with ceramic materials to come to a more precise date. Hopefully this information will be made available when the final excavation reports for Lachish are published.

**Jerusalem**

**Earthquake Evidence**

Earthquake evidence has been said to be present in Jerusalem during the eighth century B.C.² However, some controversy has surrounded these claims. Although none of the excavations have provided clear evidence, some have suggested that earthquake activities did occur in the city during the eighth century B.C. (Josephus: *Ant. IX*, x, 4; Ben-Dov 1982: 55; Yeivin 1979: 168).

Josephus states that an earthquake struck the land of Israel at the time when King Uzziah was defiling the
temple, causing the Mount of Olives to be split apart and the curtain of the Temple to be rent (Ant. IX, x, 4). A second suggestion is made by Meir Ben-Dov in connection with the so-called "Millo" house in Jerusalem. While describing the building he states that it underwent some sort of structural deterioration that began to affect the walls. He states,

To save the building, a new and equally thick wall was built up against the exterior side of the buckled area as a means of support. One explanation for this deterioration may be the massive earthquake that struck Jerusalem in the middle of the eighth century B.C., during the days of King Uzziah (Ben-Dov 1982: 55).

This new wall was built parallel to the old one and was nearly 1.4 meters thick (Ben-Dov 1982: 53).

In 1984 Yigal Shiloh published the most recent excavation report entitled, Excavations at the City of David I, 1978-1982. Although there is no earthquake mentioned throughout the excavation reports, in my view there is data that may suggest earthquake activity. In describing Stratum 12 in Area E1, which dates to the eighth century B.C., we find that the city wall in Stratum 12 underwent a process of renovation and thickening. At its core was the solid construction of the Middle Bronze Age II city wall (Strata 18-17). In squares L-N 5, it can be seen that in Stratum 12 the wall was especially thickened, to a total of about 5 m. (Shiloh 1984: 12).

This rebuilding may have been due to an earthquake which may have weakened these walls. This would also explain the added thickness of the walls.
The appearance in Stratum 12 is of "poor simple dwellings on the rock terrace east of the city-wall, outside the fortified city" (Shiloh 1984: 28), which were later abandoned. This abandonment may be due to the sudden destruction of an earthquake. These buildings appear both in Areas D1 and E2. Shiloh attributes these buildings as a "side effect of the overall process of the expansion of Jerusalem during the 8th century BCE" (Shiloh 1984: 28). However, I would suggest another possible alternative explanation. These buildings may have been used as temporary housing during the rebuilding activity that might have taken place as a result of an earthquake. This would also explain why they were abandoned at the end of Stratum 12.

A fourth indication in favor of an earthquake during the eighth century in Jerusalem is made by Yeivin in connection with the eighth-century earthquake. He states, "there is little doubt that not only were the surroundings of Jerusalem damaged but the houses in Jerusalem, itself, collapsed" (Yeivin 1979: 168). He indicates that his source for this assertion comes from Kathleen Kenyon's report of the excavations in Jerusalem (Yeivin 1979: note 166). It is here that we encounter some interpretational variation. Kenyon describes the ruins of houses without mentioning an earthquake (Kenyon 1967: 23-24).

Beer-Sheba

Tel Beer-Sheba also shows possible evidence for an
earthquake destruction level. This is shown in the description and assessment of Y. Aharoni, the excavator of Beer-Sheba. He states in the excavation report of the first season, entitled *Beer-Sheba I*,

> It would seem that Stratum III suffered some destruction at a given date around the middle of the eighth century but was immediately rebuilt by its inhabitants. On the other hand, the massive public structures, such as the casemate wall and the storehouses, suffered only partial damage; this may be indicative of an earthquake" (Aharoni 1973: 107).

This destruction takes place around the middle of the eighth century B.C. and seems to provide another piece of evidence for earthquake activity. Unfortunately the final report on the excavations at Beer-Sheba has not yet been published. When it appears it will warrant careful attention.  

**Arad**

There has been a debate concerning the exact dating of the transition between Stratum X and Stratum IX at Arad, a site located in the Negeb. The initial conclusions of excavators Ze'ev Herzog, Miriam Aharoni, Anson F. Rainey, and Shmuel Moshkovitz are that the end of Stratum X occurred when Judean control of the Negev was weakened by the succession of Edom. The weakness was exploited by the Philistines. . . . It is doubtful Arad could have avoided destruction in such an hour of peril. That event must have taken place not long after the middle of the 9th century B.C. (Herzog et al. 1984: 12).

However, in a following note by Miriam Aharoni (1985: 73) she states that she had come to different conclusions than those
expressed in the previous joint article she published with Rainey and Herzog. "Arad Stratum X existed during the last quarter of the 9th century and was destroyed during the first quarter of the 8th century B.C." (Aharoni 1985: 73). She claimed this was based on her study of the pottery and its analogies to other sites (Aharoni 1985: 73). If Aharoni is correct in her dating of the destruction of Stratum X to the eighth century B.C., is it possible that it could be an earthquake destruction?

Anson Rainey defends his previous position by referring to the misjudgment of Albright and Starkey regarding Lachish III in compressing all of the pottery into the seventh century B.C (1985: 73). He recognizes the work of David Ussishkin in identifying good eighth-century strata at Lachish since then. He also states that he may have been wrong in his conclusions (1985: 73). Rainey then admits that he "did not take into account the earthquake reported during the reign of King Uzziah (Amos 1:1, Zech 14:5) because there is no evidence of such a thing at Arad . . . [and doubts] if Uzziah rebuilt Arad and restored the route to Elath until after the earthquake" (Rainey 1985: 73). He adds that "it behooves us to avoid using the earthquake theory in dealing with the history of the Negeb" (Rainey 1985: 73). This statement is based, according to Rainey, on the apparent lack of seismic activity in the Negeb, or the lack of evidence for it. Upon further study of seismic activity in Israel, however, there
appears to be sufficient evidence to conclude that seismic activity is to this day indeed present in the Negeb and southern Israel. One of the minor epicenters in Israel was found near Beer-Sheba located just west of Arad (Amiran 1952: 53; see chapter 4). This removes the objection for an earthquake at Arad.

Considering this evidence and the conclusions of Miriam Aharoni that the destruction of Stratum X took place during the first quarter of the eighth century B.C., we may entertain the possibility of earthquake destruction at Arad during the first quarter of the eighth century (cf. Yadin 1965; Mazar and Netzer 1986; Ussishkin 1988). The complete excavation reports, when published, will provide more material for the analysis of this problem.

Samaria

The excavators of Samaria, the capital of the Northern Kingdom, and other archaeologists have debated the correlation of its stratigraphy with other contemporary sites. Yigael Yadin correlated Stratum VI in Hazor with Pottery Period IV in Samaria, based on the earthquake evidence found at Hazor in Stratum VI (Yadin 1961: 24). Based on Yadin's proposal, the original dating of the end of Pottery Period IV is to be moved some 35 years earlier.

Aharoni and Amiran, on the other hand, favor Pottery Period V of Samaria to be correlated with Stratum VI at Hazor (Aharoni and Amiran 1958: 171-178). G. Ernest Wright, the
excavator of Samaria, would also support the correlation between Stratum VI at Hazor and Samaria's Pottery Period IV, but dates it from ca. 800-750 B.C. (Wright 1959a: 19). These divergent suggestions call for a complete re-examination of the pottery and other material of these sites. Outside of these re-examinations one can hardly arrive at a satisfactory conclusion (cf. Reisner et al. 1924; Crowfoot et al. 1942; Wright 1959b; Avigad 1978).

**Summary**

The evidence for an extensive earthquake dating to the first half of the eighth century B.C. seems plausible. Seismic destruction has been attributed to several sites ranging from the northern country (Hazor) to the Judean hill country (Jerusalem) along the Shephelah (Gezer, Lachish, and Tel 'Erany) to the southern Negeb (Beer-Sheba). Although many of these sites require further excavation (Arad, Jerusalem, and Samaria among others) since they do not contain primary earthquake features, the analysis of data already excavated and the publication of final excavation reports provide strong evidence for an extensive earthquake to have taken place.

Having discussed this archaeological evidence for an eighth-century earthquake in Israel, we now turn our attention to the geological and seismological evidence for earthquake activity in the ancient Near East.
NOTES

1. Aharoni states in connection with the dating of the earthquake that, "Though not all of these assumptions are of equal certainty, it would appear that the dates of these levels would be accurate within a range of 30 to 40 years" (1979: 99).


3. The suggestion has been made that Josephus' reference to "the mountain at Rogle" may refer to the site of En Rogel (Franz 1989: 3). For further details, see Dalton 1923.

4. Benjamin Mazar first suggested that this building was the "millo" house. However, there has been some controversy since we do not know what that name actually meant. The Millo house is only mentioned once in the Bible, and therefore the designation of the term is rather ambiguous (Ben-Dov 1982: 53).

5. For a more detailed analysis of the stratigraphy and excavations at Beersheba, see Aharoni et al. 1973; 1975a; and Kenyon 1976.

6. It should be mentioned that two other sites have evidence of earthquake activity as well. Gordon W. Franz discusses the possible evidence at Ein-gev, Stratum II of Area C (Franz 1989: 2). Dever claims in note 10, and I would agree, that the evidence at Ein-gev is rather speculative (Dever in press a). The evidence at Deir Alla is well supported but not discussed in this essay due to its location in Jordan. For a discussion of this site, see Ibrahim and Van der Kooj 1977/78; 1979.
CHAPTER IV
ARCHAEOLOGICAL AND GEOLOGICAL EVIDENCE:
AN ATTEMPT AT SYNTHESIS

Chapters 1 and 2 investigated the archaeological evidence for seismic destruction at Tel Gezer and sites contemporary with the Gezer earthquake during the first half of the eighth century B.C. This chapter investigates the geological evidence for earthquake activity in Israel. Emphasis is given to seismicity in Israel in general, then issues in archaeoseismicity are discussed, and finally a synthesis of archaeology and geology concludes the chapter.

Seismicity in Israel
Current Statistics

Introduction

It would go beyond the aim of this chapter to enter into the technicalities of plate tectonics (see Zeuner 1955; Quennell 1957; Vroman 1961; Zak and Freund 1966; North 1974; 1977; Ben-Menahem; Nur; Vered 1976). It is important, however, to be acquainted with the complexities arising from the area of plate tectonics in geological study and how it relates to seismicity in general (see Wiegel 1970; Bolt 1978).

Seismicity in Israel is determined by the Afro-
Eurasian junction which runs through the Mediterranean close to Crete and on down through the Dead Sea rift (Ben-Menahem et al. 1976).1

Two sets of fault-directions have been recognized (Vroman 1967: 26). The N-S set was found as early as 1869 (Lartet) while the E-W set was recognized in this century (Bentor and Vroman 1954). The latter fault has been classified as a left-lateral strike-slip fault (Ben-Menahem et al. 1977: 82). This system of faults caused earthquakes which have been recorded and documented for a long time. It is suggested that Israel has been a seismically active region over the last 4,000 years (Ben-Menahem et al. 1977).

Current Statistics

Statistics over the past eight years (Shapira et al. 1983; 1984; 1985; 1986; 1987; 1988; 1989) have shown that Israel and its adjacent areas have been both macro- and microseismically active. This has been determined through twenty-one seismological stations located throughout Israel.

Epicenters and origin times are determined by the LME-83 program (Shapira et al. 1989). Magnitudes varied between .1 and 5.2. In 1978 M. Vered (84) published an article in which he argued that the probable maximum earthquake magnitude to be associated with the Jordan rift would be $M_L = 7.5 - 8$.2

Many epicenters have been established in very close proximity if not directly at the location of ancient sites. Amiran (1952: 48) has noted that the epicenter of Ramle-Lydda
is of importance. This is located ca. 6 km from Tel Gezer. According to current statistics (Shapira et al. 1983; 1984; 1985; 1986; 1987; 1988; 1989), Arad and Beer-Sheba have also experienced regular seismic activity (pace Rainey 1985).

Possibilities about the Past

It is possible to suggest by means of analogy that Israel was seismically active in ancient times and not only at present. It is entirely within the range of possibility, if not likelihood, that an earthquake may affect the entire land of Israel. Naturally such an earthquake would be one of a large magnitude on the Richter scale. Before reaching any definite conclusions, it is necessary to investigate issues relating to the interpretation of destructions in the past and their attribution to seismic disturbances.

Issues in Archaeoseismicity

Earthquake Catalogues

Correlations between archaeological and seismic data have been attempted. A number of earthquake catalogues have been produced (Wallis 1928; Sieberg 1932; Shalem 1952; Amiran 1951; 1952). They have been compiled on the basis of an extensive use of literary, historical, and biblical references. The compilation used most extensively by archaeologists today has been written by D. H. K. Amiran (1951; 1952). Revisions of early earthquake catalogues were provided by N. Ambraseys (1962a; 1971) and continue into
recent times (Karcz and Kafri 1978; Ben-Menahem 1979; Ambraseys and Melville 1982).

The geologists Karcz and Kafri (1978; 1981) note that some archaeologists have been eager to interpret data and attribute destruction levels to earthquake activity. They point out that they have relied on these catalogues at times without fully understanding geological contexts. Karcz and Kafri further state that the literary sources for the catalogues "are tainted by superstition and exaggeration, and their interpretation shows an unrestrained yearning for drama" (Karcz and Kafri 1981: 13).

Though there are discrepancies between various catalogues (cf. Russell 1985: 39-40; El-Isa 1985: 230), others have suggested that literary sources for earthquakes contain well-documented and valuable information (cf. El-Isa 1985: 229-230).

Since instrumental data from seismological stations do not exist for the region of Israel prior to 1953 (Ben-Menahem 1979: 199), the only sources available to the archaeologist, geologist, seismologist, and historian are those attested to in historical and archaeological records. Therefore, the researcher has to be aware of the nature of the historical records, but would be unwise to neglect it. Research must begin somewhere. When historical records of the past are available, they have to be used judiciously. Historical records must be carefully studied for their own
designs and literary purposes, compared with the archaeological and geological data where available, and investigated for possible correlations.

Another issue is the isolation of geological data without bringing it into relation with literary data and archaeological deposits. Various explanations are possible for certain observations by archaeologists outside the assignment to seismic causes, such as other geomorphological and geotechnical factors (Karcz and Kafri 1978; 1981: 21-22). In other words, the researcher has to be sensitive to the possible variety of alternative causes for the interpretation of certain observed phenomena. The observed data deserve the attention of the full range of possibilities of interpretations on the part of the archaeologist without falling into the trap of singularity of origin unless the evidence leads to such a direction.

Geomorphological and Geotechnical Factors

Karcz and Kafri (1978) point to a variety of geomorphological and geotechnical factors which could cause features of damage similar to the ones reported as evidence for earthquake destruction. They mention three distinct phenomena that have been interpreted to represent earthquake damage by archaeologists: (1) fissures and fractures; (2) oriented collapse and tilting; and (3) subsidence, sagging, and collapse (1978: 240-250). Each phenomenon may be interpreted in ways which would preclude seismic activity.
Local changes in stresses may cause a relaxation among joints, causing cracks to appear (Karcz and Kafri 1978: 240). This may occur when supports are demolished, the earth is shuffled, or when the site was cleared off for another level of occupancy (Karcz and Kafri 1978: 240). Cracks may also appear due to poor construction (Karcz and Kafri 1978: 242).

Oriented collapse and tilting in a certain direction can also be explained by various factors. Karcz and Kafri maintain that poor craftsmanship in building walls may be a cause for tilting as well as soil creep and slides (1978: 245). Vertical crustal shifts may also lead to distortion and tilting (Karcz and Kafri 1969; 1973).

Subsidence, sagging, and collapse have been explained through the repeated swelling and desiccation of the soil if it is marly and clayey (Karcz and Kafri 1978: 248). Collapse may also occur if the ground is unstable and differential compaction takes place.

Karcz and Kafri suggest a scheme of description for archaeoseismic damage consisting of 15 items to be addressed by archaeologists and geologists when investigating a site (1978: 251). G. Rapp (1986: 378) has also noted that a thorough set of criteria must be developed for assessing earthquake damage at archaeological sites. These will bear on the suggested paradigm in the final section of this study (see chapter 6).
Summary

The seismicity of Israel is due to the Afro-Eurasian junction and continues to be active. A maximum earthquake magnitude of 7.5 - 8 on the Richter scale has been estimated (Vered 1978). Thus, from a geological standpoint, an earthquake affecting the entire land of Israel is certainly possible.

A proper understanding of the relationships between the archaeological, geological, and literary data must take place. Any evaluation of an alleged earthquake destruction needs to keep these contexts in mind with all their complexities. Refinements and revisions of earthquake catalogues by specialists from all three fields of archaeology, geology, and ancient texts collaborating together are called for.

Archaeologists must carefully analyze data uncovered in excavations through careful study of the material evidence, its features, with a full knowledge of the range of possibilities of seismic, geomorphological, and geotechnical activities. Good archaeology needs to be aware of the geology of the site in question as well as the full range of historical accounts which might mention earthquake and/or other activity.

Archaeologists, geologists, seismologists, and literary scholars must join forces so as to provide the most extensive range of possibilities for the observed data.
Literary evidence must be sensibly interpreted and evaluated. It is not wise to neglect literary evidence as it may be beneficial for providing information that may contribute to a more complete understanding of the data.
NOTES

1. For further discussion on fault systems in Israel, see Quennel 1957; Ben-Menahem; Nur; Vered 1976; Shapira et al. 1986; Begin 1986.

2. For further discussion on the assessment of earthquake magnitude in general, see Bath 1969; 1981; Wyss 1979; and as it relates to Israel see Shapira 1979; 1988.

3. In a personal conversation with Iaakov Karcz (July 17, 1991) he agreed that a widespread earthquake of this type could indeed have affected the entire area of modern Israel.

4. For further discussion on the relationship between geomorphology and archaeology, see van Zuidam 1975; Kirkby and Kirkby 1976; Davidson 1976; 1985; Gladfelter 1977.
CHAPTER V
LITERARY EVIDENCE

Having correlated the archaeological evidence with the seismological-geological history of Israel, it is now imperative to assess the literary evidence pertaining to earthquakes during the eighth century B.C. The ancient literary evidence for an eighth-century B.C. earthquake can be found in but two literary collections, the writings of the Hebrew Bible and the writings of Flavius Josephus.

This chapter is divided into two major parts:

1. The first part addresses the literary evidence for the eighth-century B.C. earthquake in the Hebrew Bible. Focus will be given to the Hebrew earthquake terminology in the Hebrew Bible and its varieties of contexts. This is followed by an investigation of the earthquake under discussion in the book of Amos and the book of Zechariah. It also contains an investigation of the complex chronology of the Hebrew kings of the first half of the eighth century B.C. in order to be able to gain an understanding of the general ranges of possibility for the dating of the kings mentioned in Amos 1:1 and the earthquake referred to in the same verse.

2. The second part investigates the literary evidence
for the eighth-century earthquake in extra-biblical literature. Here attention is given specifically to the ancient writer Flavius Josephus who refers to the eighth-century B.C. earthquake under discussion.

**Literary Evidence in the Hebrew Bible**

The book of Amos has long been recognized as the product of the earliest "writing prophet" among the prophets of the Hebrew Bible (Hasel 1991a: 11), being dated by internal evidence to the first half of the eighth century B.C. If a more precise date for the composition for Amos could be determined on the basis of the kings mentioned in the extensive superscription (Amos 1:1), then the date of the earthquake from this contemporary literary source could also be more accurately dated. This in turn would be of significant assistance in dating the eighth-century B.C. earthquake discovered at Tel Gezer in the 1990 season of excavation as well as the correlations to other earthquake evidence in various sites from the same century.

Scholars seem to agree on the general time of the composition of the book of Amos. However, there is a large divergence regarding the specific date of the book and the ministry of Amos. This is due largely to the complicated chronology during this part of the divided monarchy. Special attention is given to this problem below.

Some scholars recently have placed the composition of the book of Amos as early as "possibly 780-770" (Andersen and
Freedman 1989: 183) and others before 765 B.C. (Cripps 1955: 5; Rosenbaum 1990: 23), while the majority date the book between 765 and 750 B.C. (Mays 1969: 2; Wolff 1977: 89; Soggin 1987: 4; Hayes 1988; Paul 1991: 1). The late dating in the 750s which was favored by some in an earlier period of study (cf. Smith 1896: 1, 66) seems no longer in vogue. There seems to be a trend toward an earlier dating by some recent major commentators.

These varieties of suggestions concerning the date of the book of Amos are arrived at largely by considering the superscription and other internal evidence of the book. They deserve some attention and this study will come to these dating issues time and again.

The superscription to the book (Amos 1:1) states that Amos received his visions concerning Israel in the context of three historical references: (1) "in the days" of Uzziah, king of Judah, (2) "in the days" of Jeroboam, son of Joash, king of Israel, and (3) "two years before the earthquake" (Wolff 1977: 89).

The first two references are to two well-known kings. Unfortunately the dates of these kings are not unanimously fixed within the chronology of the Hebrew kings. There are a variety of problems of chronology. This problem is discussed in the last section of the first part of this chapter. The third historical reference (i.e., "two years before the earthquake") may be related to recent
archaeological evidences for a major earthquake during the first half of the eighth century B.C. (see chapters 2 and 3 above). Thus this study does not agree with Andersen and Freedman who claim, "There is no contemporary confirmation of the occurrence of a conspicuously violent earthquake that might be identified with Amos 1:1, so as to date it" (1989: 199). It has been shown above that there is a rather significant amount of archaeological evidence for a major earthquake in the period under discussion. There is also ample geophysical and geological support for massive seismic activity, indicating that Israel has been and remains an earthquake prone area (see chapter 4 above).

The question of dating the book remains, regardless of whether there is an earthquake that can be identified. To which date should the book of Amos be assigned? Was it written prior to the earthquake? Did the prophet give his prophetic messages after the earthquake? Are there statements in the book of Amos predicting an earthquake that took place two years later? Or, were the oracles of Amos written post eventu, after the earthquake of Amos 1:1 and the other earthquake reference had been made? Answers to these questions may provide a more specific historical context for the prophecies of Amos and perhaps a more precise date for the earthquake referred to in this piece of prophetic literature. While it is the primary purpose of this study to find correlations between the earthquake at Tel Gezer and other
contemporary sites and the one mentioned in the book of Amos, it is methodologically sound to investigate first the evidence for an earthquake in the book of Amos on its own terms.

The procedure to study the earthquake in the book of Amos involves first of all an investigation of the Hebrew earthquake terminology, particularly the Hebrew roots ra\textsuperscript{c}ash and ragaz in the Hebrew Bible and subsequently in the book of Amos and Zechariah within the larger context of the Hebrew Bible. We will also analyze each appropriate earthquake text in the book of Amos (1:1; 8:8-10; 9:1-4) and Zechariah (14:5) in terms of its language, meaning, and context.

Many studies on the book of Amos seriously question the unity of the book as such. Critical scholars have employed what Shalom Paul has called the scissors-and-paste method (1991: 6; cf. Cripps 1955; Rudolph 1971; Wolff 1977). Other scholars have accepted the essential authenticity and unity of the book (cf. Hammerschaimb 1970; Anderson and Freedman 1989; Paul 1991), while still others take a mediating approach, claiming that Amos spoke orally while others wrote his words down in their present form either during Amos' later life or shortly after his death (cf. Finley 1990). It seems best to follow the more recent trend of considering Amos himself to be responsible for the production of his book.

**Earthquake Terminology in the Hebrew Bible**

A study of the Hebrew earthquake terminology begins by giving attention to the Hebrew roots ra\textsuperscript{c}ash and ragaz in the
wider context of the Hebrew Bible without attempting to exhaust every aspect of its usage in its finest detail.

The Hebrew Verb \textit{ra^ash}

The Hebrew verb \textit{ra^ash} appears 29 times in the Bible (Even-Shoshan 1989: 1088) without counting Ps 72:16.

Ps 72:16 is a text that has been assigned to a second root with the same triliteral root letters (Koehler and Baumgartner 1951: 902). However, there is high level of uncertainty regarding its designation as a second root because it is the only time that such a root would appear in the Hebrew Bible (Koehler; Baumgartner; Stamm 1990: 1186). Whether or not this text is to be included will not change the meaning of the majority usages.

The Hebrew root \textit{r^sh} has been associated with the Akkadian verb \textit{ra^asu} "to knock down." This derivation is rather speculative and cannot be substantiated (White 1980: 857). Stamm shows that the Hebrew verbal form has related forms only in West Semitic languages of a later time (Koehler; Baumgartner; Stamm 1990: 1185-1186). Thus it may be concluded that the Hebrew root \textit{ra^ash} is not Common Semitic origin. It seems to be a West Semitic term.

\textit{Ra^ash} is used in the Hebrew language in the Qal form a total of 21 times, in the Niphal form one time, and in the Hiphil seven times (Koehler; Baumgartner; Stamm 1990: 1186).

The verb is used in many of the same contexts as is the noun. Usually it is translated as "shaking" and
"trembling" of the earth or the heavens. Its primary context seems to be that of an earthquake that is a result of God's wrath and a measure of his judgment. It is commonly associated with a prediction of wrath against a nation or a people (for example, Exod 28:20; 2 Sam 22:8; Ps 18:7; Jer 4:24; 8:16; 10:10; 49:21; 51:29; 50:46; Isa 13:13; Ezek 26:15; 31:16; Amos 9:1; Nah 1:5; Hag 2:6).

The motif of the "day of the Lord"/"in that day" is used in connection with judgment and wrath. It is a central theme of Israelite eschatology. In the Hebrew Bible, ra'ash often appears in connection with the "day of the Lord" motif. In some cases it is accompanied by a darkening of the sun (Amos 8:8-10) and moon and a loss of the brightness of the stars (Joel 2:10; 4:16).

It has been suggested by some scholars that the phenomenon of the darkness/loss of brightness in conjunction with the "day of the Lord" motif may refer to an eclipse of the sun (Stephenson et al. 1975). It is not easy to be certain, because in various instances the darkness/loss of brightness motif is simply used with a prediction of the coming judgment of YHWH (for example, Exod 38:20; Isa 24:18; Joel 2:10; 4:16) which does not rule out the natural event of an eclipse.

The verb ra'ash is also used in the context of theophany (Ps 68:9) and the departure of YHWH (Judg 5:4), in addition to a number of other contexts. At times it describes
physical and natural occurrences such as the shaking of grain (Ps 72:16).

Again ra'ash describes the quaking/shaking caused by the coming of the army with its horses in the setting war or the coming of war (Jer 8:16; Ezek 26:10). It is employed for an expression such as the "quiver rattles" (ra'ash) which is another reference to war.

It has been shown that both the noun form of the Hebrew root r'sh and the verb ra'ash are used in a variety of meanings that are identical with or similar in meaning in many instances to the Hebrew term ragaz. The verb ragaz is used to "describe the literal quaking of the earth (1 Sam 14:15)" (Bowling 1980: 830) and it is often considered a synonym of the term ra'ash. Since the latter is used in Amos 9:1, it seems important to investigate its context in the Old Testament before moving on to an analysis of these terms in the book of Amos itself.

The Hebrew Noun ra'ash

The Hebrew noun ra'ash is used 17 times in the Hebrew Bible (Even-Shoshan 1989: 1088). It is a derivative of the Hebrew verb r'sh (Koehler; Baumgartner; Stamm 1990: 1186). It has been suggested that its primary meaning is "earthquake" (Childs 1959: 188; cf. 1 Kgs 19:11-12; Amos 1:1; Isa 29:6; Ezek 38:18-19; Zech 14:5).

Other meanings of the noun ra'ash include "roaring" (German dröhnen) in such passages as Isa 9:4; Jer 10:22; 47:3;
Nah 3:2; Job 39:24; 41:22, and "shaking, quaking" (German Beben, Erbeben) within a person as in Ezek 12:18 (Koehler; Baumgartner; Stamm 1990: 1186). It may be argued that the two latter meanings are derivative of the primary meaning of earthquake with its accompanying sounds (Isa 29:6; Ezek 3:12, 13 with qôl) and effects.

In Ezek 3:12-13 the departure of YHWH is being associated with "the sound of the great earthquake" (vs. 12). Several other pictures of sound are joined together, among which are the "rumbling [ra'ash] of wheels" and "the sound of a great earthquake" (vs. 13). The prophet experiences these phenomena while being lifted up by the Spirit.

In this passage two ideas are joined to one another: the departure of the Lord in connection with the sound of an earthquake. It is an event that has taken place in the past and is not a prediction.

The wheel imagery is again mentioned in Jer 47:3 and Nah 3:2. In the case of Nahum it is a prediction describing the destruction of Nineveh.

In the apocalyptic prediction of Ezek 38:18-19, a passage of particular interest and characterized by the language "in that day" (vs. 18), "a great earthquake" shall come to the land of Israel. It is of such tremendous proportions that all living creatures in the sea, in the air, and on land will "tremble" (ragaz). The usage of the noun ra'ash and the verb ragaz in connection with the "day of the
The noun ra\textsuperscript{c}ash is also used in connection with theophany. In 1 Kgs 19:12-13 an earthquake is described after which the Lord comes and speaks with Elijah. In this passage a vivid description illustrates that the Lord does not come in the storm, the fire, and the earthquake but He rather comes with the wind (Jeremias 1965: 65). This is, however, an exception to the general rule. When ra\textsuperscript{c}ash is used to describe the coming of the Lord in judgment, the earthquake is a result of His coming.

An associated meaning of the noun includes the idea of intense "shaking" linked with fear (Ezek 12:18). References are made to the "rustling, rattling" (ra\textsuperscript{c}ash) (Brown; Driver; Briggs 1979: 950) of bones (Ezek 37:7), the shaking of the earth by the "tramping" of the warriors' boots (Isa 9:4), the "clatter" of the war chariots (Jer 47:3; cf. 10:22), and the "rattling" of the javelin (Job 41:21).

It is evident from this survey of terminology that there are a number of significant contexts and associations with the idea of earthquake.

The Hebrew Verb ragaz

The verb ragaz appears 41 times in the Hebrew Bible (Even-Shoshan 1989: 1059). It is customarily considered to be closely associated with ra\textsuperscript{c}ash (Koehler; Baumgartner; Stamm
1990: 1186). It is, therefore, not surprising to find it in similar contexts.

The verb *ragaz* has a basic meaning of a "strong external/internal movement" (Vanoni 1990: 326). In the Qal *ragaz* means in connection with the subject "'erets," "land, earth," "to shake, quake" (Holladay 1971: 332). The most recent German Hebrew dictionary gives the meanings as "erbeben, in unruhige Bewegung geraten" (Koehler; Baumgartner; Stamm 1990: 1103), "to quake, to move in trembling motion." There are a number of texts in which it is a "term for earthquake" (Koehler; Baumgartner; Stamm 1990: 1103) such as 1 Sam 14:15; Joel 2:10; Amos 8:8; Ps 77:19 and Prov 30:2. In other passages it is used to express the accompanying emotion caused by various events (Exod 15:14; Deut 2:25; 2 Sam 7:10; 2 Kgs 19:27-28; 19:1; Job 12:16; Ps 4:5; 99:1; Prov 29:9; Isa 28:21; 32:10-11; Jer 33:9; Ezek 16:43; Hab 3:16; Joel 2:10). The semantic connotations may include fear that causes trembling or anger. It is, therefore, natural that it has been translated as "being disturbed" or "provoked" and the like (Brown; Driver; Briggs 1979; Koehler; Baumgartner; Stamm 1990: 1103-1104).

The verb *ragaz* occurs a number of times together with the nominal form of *ršš* or the verb *rašš* (cf. 1 Sam 14:15; 2 Sam 22:8; Ps 77:19; 18:8; Isa 13:13) aside from other Hebrew terms (Vanoni 1990: 327-328). In these contexts the verb *rašš* most often describes the movement of the earth itself,
while ragaz describes the movement of the heavens (cf. Deut 2:25; Ps 18:8; Isa 5:25) or some motion or emotion.

Again ragaz appears with a theophany (Isa 64:1), within the context of predictions (Isa 32:10; Amos 8:8), and with the motif of the "day of the Lord" (Isa 13:13; Joel 2:10). These connections are less extensive than in the case of the root ra^ash. In some instances it is used in the context of mourning as well (2 Sam 19:1; Amos 8:8).

Thus, while one may agree that the verb ragaz does act as a sort of a synonym of ra^ash in a number of contexts, it has its own extended meanings and connotations beyond those specifically linked to an earthquake and which describe the motions of an earthquake event.

Having investigated the two major terms of the earthquake terminology in the Hebrew Bible, it is possible to focus more directly on the book of Amos and subsequently on the book of Zechariah where both verbs, ra^ash and ragaz, are used in connection with the very earthquake under consideration.

The Earthquake in Amos

Amos 1:1

The superscription of the book of Amos contains three elements which serve to date the visions that Amos received, without attempting to be very specific as to the exact time when Amos actually spoke and wrote the book. Amos 1:1 affirms that this prophet received his visions (1) during the reign of
Uzziah, king of Judah, (2) during the reign of Jeroboam, son of Joash, king of Israel, and (3) "two years before the earthquake." This is the first and only time any book of the Hebrew Bible mentions an earthquake as a reference point of time with regard to the ministry of a prophet.

Earthquakes were common occurrences throughout history in Palestine and the surrounding area (see chapter 4 above). It would seem sound, therefore, to conclude that this earthquake must have been a major catastrophic event (Cripps 1955: 39; Andersen and Freedman 1989). It is not only used to date the visions of Amos in the superscription, but it is also referred to again in the message of the book itself, and it is also remembered over 150 years later in the book of Zechariah (Zech 14:5). All of this seems to indicate that it was indeed a major violent event (Smith 1989: 26).

Several possibilities exist in using the earthquake to date the book of Amos. Some scholars have suggested from the basis of the superscription that the final form of the book was completed two years before the earthquake (Anderson and Freedman 1989: 25, 87). H. W. Wolff (1977: 117-118) suggests that the book was a product of two "schools." The phrase "two years before the earthquake" derives from the "redactor who joined the original collection of 'the words of Amos' with the five-part cycle of vision reports [Amos 7-9]" (Wolff 1977: 120). Wolff is a fine example of a person who has a six-stage redaction of the book of Amos over a period of centuries.

S. M. Paul suggests in his magisterial recent commentary that the earthquake confirmed Amos' prediction as noted in the superscription (Paul 1991: 260 f45). This seems to be the more likely possibility since the visions of Amos are mentioned as taking place "two years before the earthquake."

T. J. Finley (1990: 128) believes that the earthquake is the date before which the prophet ministered for about a year.

W. Rudolph (1971: 110) also maintains that the earthquake of Amos 1:1 was one that was predicted and when fulfilled served as a point of proof that Amos was a true prophet (Amos 2:13; 9:1). Rudolph does not accept the originality of the entire superscription, but believes that the sentence "two years before the earthquake" belonged to its original kernel (1971: 111).

It goes beyond the scope of this thesis to discuss all nuances of the debate about the originality of the superscription, but certain suggestions can be made regarding various elements of the superscription of Amos 1:1. Amos 1:1 uses the term "the earthquake" (Hebrew hara'ash). The definite article in the Hebrew here was a sufficiently clear
indicator that a specific earthquake was in view. It was not just any earthquake because the country is known to have frequent earthquakes as we have seen above. It was "the earthquake" that must have left an indelible mark on the recent memory of the readers/listeners (Andersen and Freedman 1989: 193; Rudolph 1971: 110; et al.) to know exactly what the prophet meant.

The superscription of Amos 1:1 suggests that this earthquake was of such a violent nature that it was remembered for some time. This seems to indicate also that the earthquake was of fairly recent memory. "In view of the frequency of earthquakes in that part of the world, some such additional identification would soon be needed, but the text of Amos was fixed before that need arose" (Andersen and Freedman 1989: 193).

Amos 1:1 contains the time element of "two years." The RSV renders the Hebrew shenatayim with the English phrase "during two years." The NRSV does not maintain it and reads simply "two years," but keeps "during two years" in a marginal note. The question at issue is whether the Hebrew time element is to be understood as "a point of time or a period of time before the earthquake" (Andersen and Freedman 1989: 193).

This had been a matter of some debate among scholars. If it is a period of time, then it may mean that during this two-year period Amos functioned as a prophet. In this case Amos delivered his messages within the two-year time before
the earthquake occurred. If "two years" is taken as it stands and is used for a "point of time," then it means that the ministry of Amos had been concluded before this period of time of two years commenced. T. J. Meek considered the "accusative of time" in Amos 1:1 and concluded that in this passage a point of time is indicated (1941a, 1941b). If this suggestion has merit, as seems to be the case (Andersen and Freedman 1989: 193), then the conclusion that the "two years before the earthquake" actually are a point of time that concludes the prophetic ministry of Amos would seem sound. In this case Amos must have delivered his prophecies "two years before the earthquake" and "the earthquake" serves to date the conclusion of Amos' prophetic activity, even recording "the fulfillment of the prediction 'in the days of Uzziah'" (Andersen and Freedman 1989: 193).

Our impression on the basis of this syntactical analysis of the phrase "two years before the earthquake" in relation to the reigns of king Uzziah and that of king Jeroboam is that this time element is a precise concluding date for the prophecies, or "visions," which Amos had received in his ministry. The "two years before the earthquake" is the terminus ad quem of the activity of Amos. His prophetic function took place somewhere during the reigns of kings Uzziah and Jeroboam and concluded "two years before the earthquake."

We will return later to the complex dating issues of
the kings Uzziah and Jeroboam II. This is important also for a dating of the earthquake, since this natural catastrophe must have taken place during their reigns. Before beginning this debate on the dating a continuation of the investigation of the passages in which earthquake activity has been seen follows below.

Amos 2:13

Several scholars have seen an earthquake in Amos 2:13 although the typical earthquake terminology is not present in this passage. Rudolph has emphatically suggested that the "oracle against the nation" of Israel in Amos 2:13-16 is reflective of an earthquake (1971: 111). He believes that Amos 2:13 contains the "announcement of an earthquake, which had now been fulfilled and which established that Amos was a prophet" (1971: 148). H. Gese has suggested that the rare Hebrew word ^wq is to be linked with the Arabic term ^aqqa, "to split (open)" and that instead of its customary meaning of "to press down" it means that the earth will be "split open" and that this is a reference to the earthquake (Gese 1962: 421). This interpretation has been supported by Wolff; it was further supported by him with reference to the Ugaritic term ^qq, "to rend" (1977: 171). Thus, the earth is "rent" open as in an earthquake. This is how Wolff puts it, "the cart's wheels break open the soft ground reminiscent of those produced by an earthquake. Indeed, the point of the simile is
to indicate that Yahweh will soon act against Israel by means of an earthquake" (1977: 171).

This interpretation of this rare term (see Koehler; Baumgartner; Stamm 1990: 758) is rejected by Rudolph (1971: 148-149) who derives the meaning of this term with the aid of Arabic ḏāwq, "to bend," so that an earthquake is in view for the bending of the earth. Other interpretations are used for this rare word from various other languages and versions (Müller 1971). The basic conviction of all these attempts is that an earthquake is seen here in Amos 2:13 (Smith 1989: 75, 91; Finley 1990: 173).

There are other scholars who do not follow this line of interpretation (Stuart 1987: 319). W. R. Harper stated some time ago in succinct terms, "There is nothing in the words themselves, or in the context, to suggest an earthquake" (1905: 61). Paul points out that "the meaning of the verb is somehow related to a punishment by an earthquake does not follow from the vivid description of the ensuing verses of the total incapacitation and immobility of the armed forces of Israel" (1991: 94). This context of war does not seem to lend itself easily to a natural catastrophe such as is the case with an earthquake.

It may be necessary to have a clearer indication for an earthquake than is presently available in this text. Due to the lack of typical earthquake terminology, the lack of a natural catastrophe, and the usage of a war context, it seems
prudent to refrain from considering Amos 2:13 as speaking of a predicted earthquake.

Amos 8:8

Amos 8:8 contains in sublime poetry two searching questions: "Shall not the earth shake [Hebrew ragaz] for this, and all that dwell on it mourn? Shall it not all rise like the Nile, and surge and subside like the Nile of Egypt?" (NJPS).

In Amos 8:8 the root ra'ash is not used as it is in Amos 1:1 and 9:1. The verbal form ragaz, "to tremble, shake," is employed by the author. As has already been shown above, this verb acts often as a synonym of or in close association with ra'ash in the Hebrew Bible.

In the same verse, vivid earthquake imagery describes the event. The result of the "trembling" of the earthquake consists of the "mourning" of the inhabitants of the earth. They mourn because of the destruction that this natural event has brought about in terms of life and natural possessions.

The earthquake's movement of the earth is depicted as the rising and falling of the Nile which seems to refer to the inundation of the Nile. Wolff (1977: 329) suggests that the comparison to the Nile seems strange since the movements of the river were gradual and over several months. But "the speed with which the Nile rises and falls is not the point of comparison" (Smith 1989: 255). The point of comparison is the up and down movement. "The sensation of feeling the land
move, rise and fall, is usefully associated with earthquakes" (Andersen and Freedman 1989: 811). Paul (1991: 260) has the same view and adds that "God's wrath shall be concretized by the convulsion of the earth's surface." It is the cosmic effect of Israel's immorality that causes God to undo what He has brought about in creating the world.

Verse 8 does not stand in isolation. The poem continues and includes verses 9-10. Another cosmic event is depicted in these verses:

On that day, says the Lord God, I will make the sun go down at noon, and darken the earth in broad daylight. I will turn your feasts into mourning, and all your songs into lamentations; I will bring sackcloth on all loins, and baldness on every head" (NRSV).

The darkening of the sun during the day is depicted. This seems to be a prediction of a solar eclipse (Andersen and Freedman 1989: 821; Smith 1989: 254).

There is little doubt about the reference of a solar eclipse in Amos 8:9. Most more recent commentators refer to it and specialized studies have assigned the attested eclipse of June 15, 763 B.C. (Soggin 1970; Stephenson 1975: 118) to this text. This linkage to "absolute chronology" (Noth 1966: 272-273) is of importance. Wolff gives another, earlier eclipse as an option which is dated to February 9, 784 (1977: 329). This alleged second eclipse is also mentioned in the 1991 commentary on Amos by Paul as follows: "According to the Assyrian eponym lists, there was an eclipse on February 9, 784, and on June 15, 763" (1991: 262 f7).
If there were two different eclipses, then the possibility of fitting the reigns of the kings Uzziah and Jeroboam and the earthquake into the framework of absolute chronology would receive entirely new options. A. Ungnad (1938) provides the most extensive investigation into the eponym lists. An investigation into the evidence he provides does not support a second eclipse on February 9, 784 B.C., but this does not mean that astronomical data cannot support such an eclipse.

The only eclipse for the 8th century B.C. in the eponym lists is mentioned in the year of the governorship of Bur-sagale. The decisive text, duplicated in several eponym lists, reads, "ina arah sîmâni dshamash attalâ ishtakan" (Ungnad 1938: 430, 432) and is translated into English as follows: "in the month of Siman there was a darkening of the sun" (transl. from Ungnad 138: 447).

The dating of this single eclipse of the sun from the eponymy of Bur-sagale, dated by most experts to June 15, 763 B.C., "serves as a reference point for determining absolute dates for most of the Neo-Assyrian eponymies, the reigns of the Assyrian kings of the first millennium, and--by means of synchronisms--the absolute chronology of Post-Kassite Babylonia" (Brinkman 1968: 68). This shows the chronological significance of this eclipse of the sun.

In the last century, however, this eclipse of the sun has been under some debate. It had been suggested by J. D.
Michaelis as long ago as 1872 that the eclipse of Amos 8:9 is to be dated to February 9, 784 B.C. (Michaelis 1872). This date has been taken up by others as another eclipse of the sun in addition to the one of June 15, 763 B.C. (see Cripps 1955: 316; Wolff 1977: 329; Paul 1991: 262 f7). There is indeed a possibility of an eclipse of the sun for the year 784. It is unrelated to the one during the eponymy of Bur-sagale which is dated to June 15, 763 (Ginzel 1899: 243-245; Ungnad 1938: 414).

The question of relevance is whether this near total eclipse of the sun of June 15, 763, is a decisive moment in Samaria, Bethel, and Jerusalem. Ginzel points out that according to the study of Bosanquet published in 1874 the maximum of the eclipse for Jerusalem would be about 10".6' on a scale 12" or more for a total eclipse. This would mean that it was a partial eclipse in Jerusalem (Ginzel 1899: 245), while the Assyrian eponym list mentions it for Nineveh where it was a near total eclipse with about 11".1' on a scale of 12".

Astronomers have determined that other eclipses of the sun took place in the first half of the eighth century B.C. Another one is dated to May 5, 770 B.C. which would have in Jerusalem a measure of 8".0' (so Mahler as cited in Ginzel 1899: 245) or 6".7' in the reckoning of Ginzel (1899: 245). Another total eclipse over much of Palestine is the one dated to September 16, 777 (Ginzel 1899: 9, 44). Evidently the
famous eclipse of the sun of June 15, 763, is but one option among eclipses to be considered for Palestine in the first half of the eighth century B.C.

Both earthquake and eclipse have been shown to be used in other "day of the Lord"/"on that day" references in the Hebrew Bible. Paul (1991: 263) notes that both the earthquake and the eclipse are followed by mourning. There are two cosmic effects combined by an equal reaction of mourning on the part of the inhabitants of the land. This close association of the solar eclipse with the earthquake may in all likelihood indicate that the two events in the natural world were predicted by Amos and may very possibly have been fulfilled in close proximity to each other. If this suggestion has any merit, we would have a linkage of the earthquake with an astronomical date in conjunction with a solar eclipse. As we have seen above, a number of possibilities are available.

Amos 9:1

Most recent commentators recognize an earthquake in Amos 9:1:

I saw the Lord standing beside the altar, and he said; Strike the capitals until the thresholds shake [Hebrew ra’ash] and shatter them on the heads of all the people; and those who are left I will kill with the sword; not one of them shall flee away, not one of them shall escape (NRSV).

This is a text that presents a number of ambiguities. It may be rather helpful if the text would inform us as to
addressee of the command, "Strike the capitals until the thresholds shake." This question is not irrelevant with regard to the issue of the earthquake that is seen in this text.

It has been suggested (see Rudolph 1971: 241; Paul 1991: 274; Smith 1989: 266-267) that the imperative is directed towards Amos (van Hoonacker 1908; Reventlow 1962: 48-49; Neher 1981), an angel or member of the heavenly court (Keil 1882; Harper 1905; Driver 1915; Gese 1981; Andersen and Freedman 1989; and others), YHWH himself (Marti 1904; Robinson and Horst 1954; Weiser 1929; Amsler 1982; Hammerschaimb 1970; Wolff 1977), and a "power of nature" (van Gelderen 1933). It is not to be ruled out that YHWH addresses the power that produces the earthquake.

It must be admitted, however, that the text itself is ambiguous and unclear. It clearly affirms that YHWH has given the command that the holy place should be shaken to its very foundations. J. L. Mays writes insightfully: "To whom the imperatives are addressed is not said. Probably they are simply rhetorical, a way of saying with emphatic authority: 'Let the capitals be smitten . . . be scattered'" (1969: 153; cf. Smith 1989: 266; Finley 1990: 313).

Equally unclear is the identity of the place of worship. The majority of commentators identify the sanctuary as the one in Bethel (cf. Andersen and Freedman 1989: 853; Paul 1991: 274; and others), a place located some ten miles
north of Jerusalem and belonging to the northern kingdom. This may be the case indeed, even though it has also been suggested that the Jerusalem temple may be implied (Targum, Calvin). It seems, however, that the sanctuary in Bethel is in view because the altar is described as "the altar," i.e., a specific altar that need not be more clearly defined (Paul 1991: 274).

Bethel was the place at which Jeroboam I established a sanctuary (1 Kgs 12:26-33; 13:1-2) as he did also in Dan. It was a religious center and functioned as a royal sanctuary in the time of Amos under Jeroboam II (Amos 4:4; 5:5-6; 7:10, 13) and is mentioned in the contemporary writings of Hosea (Hos 4:15; 10:5, 8, 15; 12:5). The role of Bethel was significant (Keller 1955: 162-168; Dumbrell 1974: 65-76). It was the place of major confrontation between Amos and Amaziah, the priest of Bethel (Amos 7:10-17).

The "altar" (Amos 9:1) is mentioned earlier in the book of Amos (Amos 3:14: "altars" [see Paul 1991: 124]) within a prediction of the destruction of the "altars" of Bethel by YHWH. There are exegetes who suggest that this earlier prediction about the punishment/destruction of "the altars of Bethel" in Amos 3:14 is also a reference to an earthquake (cf. G. A. Smith 1896; Sellin 1930; Fosbroke 1956; Amsler 1982; Rudolph 1971: 165). One cannot be certain that this is the case, unless we assume that the destruction referred to is identical to that of Amos 9:1.
Is it possible to arrive at a definite dating of the destruction of "the altar" and respectively the sanctuary of Bethel as mentioned in Amos 9:1 by an earthquake? If excavations at Bethel would reveal such a destruction by earthquake, then archaeologists would render invaluable evidence for the timing of an earthquake.

Bethel has been identified with Tell Beitin by Edward Robinson in the 19th century. Excavations have been carried out at Tell Beitin by W. F. Albright in the 1930s and subsequently by J. L. Kelso (Albright 1935a; 1935b; Kelso 1955; 1958; Albright and Kelso 1968). No altar has been discovered and no sanctuary has been found. It is suggested that the sanctuary may be located under the present village of Beitin (Jamieson 1975: 532).

This widely supported identification of Bethel has been questioned more recently. The site with which Bethel is identified in this alternate view is el-Bireh (Livingston 1970; 1971), a place within one hour's walking distance southwest of Beitin. This alternative site and its possibilities have been evaluated (Bimson 1981: 205-211) in view of its challenge (Rainey 1971). At present el-Bireh has not been excavated and until this is done, the new location suggested for Bethel as the site of el-Bireh remains but a possibility which, however, seems at least as good as the traditional theory (Wiseman 1971; Bimson 1981: 210-211).

The archaeological evidence seems unclear at this time.
and without new soundings it is of no assistance in finding an earthquake or a date for it in connection with Bethel.

In short, Amos 9:1, based on carefully textual analysis, makes a terminological reference to an earthquake destruction of the sanctuary assumably of Bethel with the use of the Hebrew verb ra\textsuperscript{c}ash. The shaking of the "thresholds" and the falling of the "capitals" on the heads of the worshippers communicates destruction by earthquake activity.

The Earthquake in Zechariah

An earthquake which occurred in the days of king Uzziah is mentioned in Zech 14:5. Within an apocalyptic oracle about future destruction the comparison is made that the remnant of the inhabitants of Jerusalem shall flee as they did in the case of the earthquake in the days of Uzziah: "And you shall flee by the valley of My mountains, for the valley of the mountains will reach to Azel; yes, you will flee just as you fled before the earthquake [Hebrew ra\textsuperscript{c}ash] in the days of Uzziah king of Judah" (NASB).

Zech 14:5 is important because it is a later reference to the earlier earthquake. First of all, it proves, aside from Amos 1:1, that there actually occurred an earthquake in the days of Uzziah.

Second, the earthquake must have been particularly violent since the memory has lasted a long time. This is significant since Israel is earthquake prone and many earthquakes are known to have taken place. If this earthquake
in the reigns of Uzziah and Jeroboam had been simply a normal earthquake, then it would not have left the kind of memory that this one left. The memory was one of violence and one where people fled in masses.

Third, the earthquake mentioned here is linked to Jerusalem. Jerusalem had not been in view in the earthquake passages in the book of Amos which have been investigated above. In Amos 9:1 it seems that the earthquake is linked geographically to the city of Bethel, the city which contained the royal sanctuary. Here in Zech 14:5 the earthquake is linked to the city of Jerusalem. From these two locations of the earthquake of Uzziah's day, it may be suggested that the earthquake under discussion involved a larger area of destruction than a very small region. Thus earthquake evidence may be looked for throughout the entire territory of Syria-Palestine.

Fourth, the date of the earthquake is assigned to the "days of Uzziah." The expression "the days of" refers to the lifetime of a person (Job 1:5), but when used in conjunction with a king, it means his reign (Andersen and Freedman 1989: 192). In this case it supports the datelines of Amos 1:1 where the earthquake is mentioned as having occurred during the reigns of Uzziah and Jeroboam. It remains unclear whether the sole reigns of these kings are in view or their respective co-regencies. This deserves more attention in the following part of this study.
Chronology of the Reigns of Uzziah and Jeroboam II

The chronology of the divided monarchy of the Hebrew kings is filled with controversy and difficulty regarding the exact span of time of the reigns of certain Hebrew kings. The complexity arises from co-regencies, the question of accession year/non-accession year reckoning, and the Nisan (Spring) or Tishri (Fall) calendar. These and other issues have caused a variety of chronological theories of the Hebrew kings (McFall 1991).

Major difficulties are present during the eighth century B.C. It is this period which will have our attention within the study of the literary evidence. In the overview, special attention is given to the reigns of Uzziah/Azariah of Judah and Jeroboam II of Israel. Both are mentioned in Amos 1:1 where the earthquake is also mentioned.

In the most recent attempt to settle the chronology of the Hebrew kings, Leslie McFall has classified past theories into three categories: reconstructionists, restorationists, and harmonists (1991: 6). For the sake of convenience, these designations will be followed.

Some scholars, whom McFall has referred to as belonging to the reconstructionists, have abandoned any attempt to establish dates for the reign of Uzziah, listing a number of "crucial unknowns" that make such an attempt from their perspective impossible (cf. Miller 1967; 1985: 167). They do not wish to accept the Massoretic text in its entirety.
as providing historical accuracy in chronology. By assuming that certain figures and statements are incorrect and by inserting what seems most logical, they have not been able to solve the problems of chronology.

Other reconstructionists suggest two possibilities for dating. Alfred Jepsen dates Uzziah's reign from 787-736 B.C. He holds that the co-regency with his son Jotham begins in 756 and ends in 741 B.C. However, in parenthesis he provides the dates 759-744 for Jotham and dates Jeroboam II's reign to 787-747 (Jepsen 1964: 39). He attempts to extend Uzziah's reign, reducing, however, the reign of Hezekiah. Nevertheless, Jepsen states "[es] scheint mir der angegebene Weg, nicht nur der Zeit Jothams ganz, sondern auch des Ahas zum Teil in die Zeit Asarjas zu verlegen, der einfachste zu sein, weil er die Überlieferung am wenigsten zu ändern braucht" (Jepsen 1964: 38). He, therefore, collapses the reigns of these kings.

There have been several scholars who have suggested one sequence without giving two dates for co-regencies. However, just as those listed above, they do not solve the problems of the chronology of the Hebrew kings of this period. Sigmund Mowinckel, for example, established the following dates: Uzziah 776/75-735/34, Jotham 749/48-734/33, and Jeroboam 790/89-749/48 (Mowinckel 1932: 271).

Joachim Begrich used a system similar to that of Jepsen's. He suggested that Uzziah reigned from 785/84-747/46
and Jotham reigned from 758/7-743/2. He places Jeroboam's reign between 787-748 (Begrich 1929: 46).

William F. Albright suggested his own chronology after studying those of Begrich, Mowinckel, Lewy, and others. After making a number of "corrections" in the text, Albright provides the following dates: Uzziah 783-742, Jotham (as regent) 750-742, and Jotham as king 742-735. Jeroboam is dated to 786-746 (Albright 1945: 21).

Siegfried Herrmann also provides a chronology. He dates Uzziah from 769/68-741/40 and Jotham 741/40-734/33 (Herrmann 1975: 228). These reconstructionists all maintain a late accession for Uzziah.

In 1951 Edwin R. Thiele published what seemed to be the solution to the chronology of the Hebrew kings in general and to the period under consideration in particular. His harmonist approach attempted to accept the Masoretic text in its entirety. He was able to accomplish this by using the following principles: (1) that the accession year had not been regarded as part of the total years of the king's reign, (2) that the years may have been calculated as beginning either in the Spring (Nisan) or in the Fall (Tishri), and that there were co-regencies (Thiele 1965: 16-25). This combination of factors was a breakthrough.

Thiele concluded that Judah began reckoning with the accession-year system; that during a time of intermarriage and alliance with Israel the system of Israel was adopted by Judah.
for four reigns, and that subsequently Judah returned to her original form of reckoning. Regnal years in Judah began with Tishri and regnal years in Israel began with Nisan (Thiele 1965: xv). Accordingly, Uzziah's regnal years are 792/91-767 in co-regency with Azariah, and then 767-750 as sole regent. His son Jotham had a co-regency with him from 750-740/39, when Uzziah died. Jotham begins his co-regency with Uzziah in 750 and continues to reign until 732/31.

Jeroboam II began his reign as a co-regent in 793/92 with his father Jehoash and started his sole reign in 782/81; he finished it in 753 (Thiele 1983: 111-116).

In the year 1988 a new chronology was presented by John H. Hayes and Paul K. Hooker (1988). These scholars follow the restorationist school, rejecting a number of Thiele's essential proposals. They suggest the following:

1. There were no co-regencies.

2. Five kings—Baasha in Israel and Asa, Jehoash, Amaziah, and Azariah in Judah--either abdicated their throne because of physical problems or were forced to give up the throne.

3. The numbering of the years of a king's reign began from the fall New Year festival (year one with the coronation and year two with the second fall festival of the king).

4. If a king was on the throne at the New Year festival, he was assigned a year's reign regardless of the length of his rule.
5. Israel observed a Marheshvan to Marheshvan
calendar, while Judah employed a Tishri to Tishri calendar.

6. In later translations efforts were made to
harmonize allegedly conflicting evidence, hence none of the
versions contain any authentic data that can be employed in
reconstructing the chronology (Hayes and Hooker 1988: 12-15).

These methodological procedures provide the following
dates for the eighth century in the Hayes and Hooker
chronology: Uzziah, 785-760 B.C.; Jotham, 759-744 B.C.;
Jeroboam II, 788-748 B.C.

John N. Oswalt follows the dates of Thiele and gives
perhaps the most concise summary on the chronology of Judah
and Israel in the eighth century. Oswalt states:

In Judah the first co-regency, that of Amaziah and
Uzziah, was one of necessity; for Amaziah, in a burst of
false confidence, challenged Israel under Jehoash and was
taken captive (2 K. 14:13; 2 Ch. 25:23). That this event
took place in 792 and that Uzziah became co-regent in
that year is evident from a study of five apparently
conflicting references. 2 K. 14:17 makes it plain that
Amaziah died fifteen years after Jehoash of Israel.
Since Jehoash's death (and the accession of Jeroboam II?)
can be fixed in 782/781, Amaziah died in 768/767. In
accord with this, 14:23 reports the coronation of
Jeroboam II in Amaziah's fifteenth year, or 782. This
would mean that Uzziah, Amaziah's successor, should have
come to the throne in the fifteenth or sixteenth year of
Jeroboam II. Yet 15:1 records Uzziah's accession in
Jeroboam's twenty-seventh year. The best resolution of
this difficulty sees Jeroboam II as having become co-
regent with his father in 793 just before the war with
Judah. Since Jeroboam ruled forty-one years (14:23), he
died in 753/752 and was succeeded by Zechariah. However,
15:8 demonstrates that Zechariah began to reign in the
thirty-eighth year of Uzziah. If Uzziah's reign is dated
from 768, then Zechariah's accession is pushed down to
730, at least twenty-three years too late. On the other
hand, if 753 is correct, then thirty-eight years prior to
date [sic] results in a figure of 792/791 for the capture
of Amaziah and the beginning of Uzziah's total reign (Oswalt 1979: 682-83).

McFall suggested a chronology similar to that of Thiele with few minor alterations. He claims that Uzziah died between April and September 739 and Jotham became king during this period, not 740/39 as Thiele suggests (McFall 1991: 10). The co-regent reign of Uzziah then falls between September 791 and the day of his death in 739. His sole reign can be calculated from April-September 767 and April-September 750 at which time Jotham begins his co-regency with his father (McFall 1991: 10).

Jeroboam II begins his co-regency in April 793 which continues to his death in August-September 753. His sole reign begins in September 782-April 781 and continues to August-September 753 (McFall 1991: 10). For the purposes of this study, I have followed the refined chronology of McFall which is essentially the same as that of Thiele with the exception of a few months, which in turn may put the date to a different year.

Based on these considerations, there are three possibilities for the time frames within which the earthquake seems to have occurred, if one assumes that the "two years before the earthquake" in Amos 1:1 is before the end of the reigns of the two kings mentioned.

The shortest time span, at the end of which the earthquake may have taken place, is between the sole reigns of both Jeroboam II and Uzziah, if one subtracts at the end two
years for the earthquake, (i.e., 767/765-753/751). The second possibility lies within the sole reign of Jeroboam and the coregency of Uzziah with Amaziah, (i.e., 782/780-753/751). The third option takes in the co-regency of both Jeroboam with Jehoash and Uzziah with Amaziah, (i.e. 791/789-753/751).

The earthquake referred to in the book of Amos and in the book of Zechariah could be placed within any one of these three time slots. At present it is not possible to be more specific with regard to the evidence from literary sources.

Extra-biblical Literary Evidence

Extra-biblical sources have been cited by several scholars in determining a date for the earthquake during the time of Uzziah and Jeroboam II (Dever in press a; Soggin 1970; Yeivin 1979). These sources deserve careful scrutiny. They need to be evaluated so as to determine whether they can be taken at face value and as historically reliable.

W. G. Dever states among many others (cf. Soggin 1970) that literary evidence exists from Flavius Josephus and certain Rabbinic sources (Dever in press a). Dever depends on G. Franz (1989: 6). The latter notes that "some of the rabbinic sources have seen a reference to the tsunami phenomenon in Amos 5:8 and 9:6 where it is stated, 'Who calls for the waters of the sea, and pours them out on the face of the earth' (Luria 1987: 259-262)" (Franz 1989: 6). Amos 9:6 is interpreted as a tidal wave caused by an earthquake, as is
Amos 5:8 (Luria 1987: 260-262). This interpretation has rabbinic support, but this neither proves that it is correct nor that there is historical evidence for such an event in the time of Amos or subsequent to it.

Apocryphal Writings

There seems to be a reference to an earthquake in the "Testament of Levi" in the "Testament of the Twelve Patriarchs" which is dated to about 150 B.C. (Kee 1983: 778). The passage reads: "So when the Lord looks upon us all tremble. Even the heavens and the earth and the abyss tremble before his majesty" (Levi 3:9). The usage of the term "tremble" with regard to heaven, earth, and abyss may be suggestive of an earthquake in the apocalyptic "day of the Lord." This is not an earthquake related to the eighth century B.C.

Another reference to an "earthquake" is present in "the apocalypse of the twelve calamities and the coming of the Messiah" in 2 Baruch (ca. 100 A.D.). Within a statement that time will be "divided into twelve parts" (2 Bar 27:1) comes the statement of vs. 7: "In the sixth part: earthquakes and terror" (Klijn 1983: 630).

In "the Lives of the Prophets," an apocryphal book from the first century A.D., an "earthquake" is referred to in the time of Nahum which caused Nineveh to be inundated by water:

After Jonah this man [Nahum] gave to Nineveh a portent
that it would be destroyed by fresh water and an underground fire, which also happened. For the lake which surrounds it inundated it during an earthquake, and fire coming from the wilderness burned its higher section (Lives 11:2-3).

There is no mention here of an earthquake in the time of Amos.

A few other references to earthquakes come from the apocrypha (Pseudo-Philo 6:17 in the time of Abram; 11:5 referring to the giving of the Law on Sinai; 16:6 reporting the swallowing up of the sons of Korah; Artapanus 3.27:33, referring to the time of Moses). None of them reflect on the earthquake mentioned in the books of Amos and Zechariah.

Josephus

The Jewish historian Flavius Josephus describes in his work Antiquitates Judaicae events leading to the earthquake during the time of Uzziah, the king of Judah. The following quotation states his views:

And when they cried out, that he [Uzziah] must go out of the temple and not transgress against God, he was wroth at them, and threatened to kill them, unless they would hold their peace. In the meantime a great earthquake shook the ground, and a rent was made in the temple, and the bright rays of the sun shone through it, and it fell upon the king's face, insomuch as the leprosy seized upon him immediately; and before the city at Eroge, half the mountain broke off from the rest on the west, and rolled itself four furlongs, and stood still at the east mountain, till the roads, as well as the king's gardens, were spoiled by the obstruction. Now as soon as the priests saw that the king's face was infected with the leprosy, they told him of the calamity he was under, and commanded that he should go out of the city as a polluted person. . . . So he abode out of the city for some time . . . and lived a private life, while his son Jotham took the government (Ant. IX, x, 4).

Josephus makes four claims in his account of the
events of the earthquake: (1) Uzziah defiled the temple and was struck with leprosy as a result of his sin,² (2) an earthquake occurred at the very time of his defilement as an act of punishment from God, (3) Uzziah was ostracized and lived outside the city for some time, and (4) Uzziah's son Jotham ruled in his place.

When we compare this account with the Biblical texts we find certain correlations (2 Kgs 15:5 and 2 Chr 26:16-21). Uzziah defiled the temple; he was consequently struck with leprosy; he lived outside of this city, and Jotham governed the people.

There are also very decisive differences. The earthquake which is mentioned in Amos 1:1 and Zech 14:5, and in both instances associated with the reign of Uzziah, is never linked with the defilement of the temple nor with Uzziah contracting leprosy (2 Kgs 15:5 and 2 Chr 26:16-21). The claim of Josephus that the leprosy and earthquake together were a divine judgment against Uzziah for defiling the temple is a tradition found only in his writings. It is not supported in the Biblical text or any other literature of his time.

Several decisive questions arise: Does Josephus who wrote some 800 years later have a correct tradition? What evidence is there for or against the historicity of Josephus' associations? How reliable is Josephus as a historian?

It is generally assumed that an older document closer
to the event in question would be more reliable than a later document. In this case, Josephus postdates the writing of Amos by ca. 800 years. If Josephus is accurate, where does he draw his information from? We have seen above that there is no other literary evidence available that has a similar story or conflation and expansion as he presents it.

Some scholars have questioned the historicity of Josephus on various counts, particularly when referring to miracles (Betz 1974; 1987; Attridge 1976). According to Otto Betz, Josephus "used the narrative parts of the Old Testament as the main source of his work Antiquitates Judaicae . . . but seems to have an ambiguous attitude toward the miracles" (Betz 1987: 212). Betz suggests that while Josephus wanted to uphold the Biblical tradition, he was known to add to his report (Betz 1987: 212). For example, in the miracles of punishment "Josephus even increases the disaster by adding nonscriptural details" (Betz 1987: 217). Betz included the account of the punishment of King Uzziah by leprosy as well (Betz 1987: 218). The uniqueness of Josephus on the timing of the earthquake and his frequent embellishments with miracles does not lend itself to accept the timing of the earthquake as a reliable historical source.

This insight is of utmost importance. It may be that Josephus, in his attempt to increase the disaster of this miracle of punishment, joined the two previously separate events of the Hebrew Bible -- that is, Uzziah being struck by
leprosy (2 Kgs 15:5; 2 Chr 26:16-21) and the earthquake during the reign of Uzziah (Amos 1:1; Zech 14:5). He heightens the miracle still more by adding that the temple was rent and the bright rays of light of the sun shone upon Uzziah, at which point leprosy struck him. His connecting of the two events and adding a new one may hardly be considered an attempt to synchronize the chronology of the earthquake in order to establish a historical date. Josephus seemingly wishes to heighten the miraculous so as to enhance his narration of the powerful justice of God's divine punishment (cf. Delling 1958; MacRae 1965). On this basis, the account of Josephus can hardly be used as a reliable source to fix an absolute date for the earthquake of Amos. Josephus provides the only extra-biblical account of an earthquake during the time of Uzziah, but outside of his addition of a miracle not mentioned in the Hebrew Bible, his account is dependent upon it. In view of Josephus' writing techniques, it is not wise to use him for dating purposes, due to the embellishments of miracles which have other purposes than chronological ones in his writing technique.

Summary

It has been indicated that the Hebrew terminology used in the biblical text (ra'ash, ragaz) may have a variety of meanings. A major meaning of the noun ra'ash is "earthquake." Often the word is used in connection with the "day of the Lord" motif, theophany, or the departure of YHWH. The
"earthquake" in Amos 1:1 was certainly a literal seismological event that took place in actual history. In the case of Amos our investigation has pointed in the direction that Amos had completed his message "two years before the earthquake."

The passages of Amos 8:5 and 9:1 reveal that Amos predicted an earthquake and that upon its arrival his prophetic preaching and his message seems to have gained a powerful confirmation.

Based on the chronological information of the reigns of kings Uzziah and Jeroboam II, this earthquake may have taken place either between 767 and 753 B.C., 782 and 753 B.C., or between 791 and 753 B.C., depending on whether co-regencies are taken into consideration or whether only the sole reign is used in the calculation. The cut-off date is 753 B.C. because this is when Jeroboam dies and the visions must have come to a conclusion by that time if the reigns are meant to provide the framework within which Amos' ministry took place.

The account of Josephus which links the earthquake to the leprosy of Uzziah has been cited to support the date of 750/51 for the earthquake (Yeivin 1979). In view of this study of the historical accuracy and the writing technique of Josephus, the latter cannot be relied on for historical dating (with Rudolph 1971: 110 f6 et al. against Cripps 1955: 40-41). Josephus makes his own connections and additions. Rabbinic support for an earthquake does not exist. The rabbis merely
comment on certain Amos passages (Amos 4:11; 6:11; 9:1), linking them to an earthquake.

This chapter has presented a clearer picture of the prediction (Amos 8:5; 9:1) and fulfillment (Amos 1:1) of the earthquake and its dating within the narrower or larger time frames of the two kings mentioned in Amos 1:1, that is, 791-753 B.C. To be more precise on the date of the earthquake based on the literary evidence in the Hebrew Bible seems to go beyond the specifications of the biblical text. While the tendency of exegetes is to go toward the end of this period, there is nothing that would require the earthquake to occur late in that time frame.
NOTES

1. For a more detailed overview on the impact of the "day of the Lord" motif and eschatology, see von Rad 1959; Weiss 1966; Carniti 1970; Everson 1974; 1976; and Hoffmann; 1981.

2. There is some controversy concerning the exact nature of the disease. According to J. Alberto Soggin the disease was a type of skin ailment other than 'Hanson's disease' that was contagious but not fatal (1984: 218-219).

3. Both Yeivin and Dever use the tradition of Josephus to date the earthquake evidence at Tel 'Erany and Gezer respectively (see Yeivin 1979; Dever in press a). It might be suggested to rely more heavily on the stratigraphical and architectural evidence as well as the Biblical literary evidence in the book of Amos and Zech 14:5, rather than on Josephus, due to his own unique interests in showing God's punishment through miracles.

4. When comparing Josephus with the archaeological record of his time (1st century A.D.), one finds he is quite accurate although at times inconsistent. Zeev Safrai commends Josephus for his general accuracy, but points out a number of inconsistencies, particularly in his description of the land of Israel (Safrai 1982: 91-115). Eric M. Meyers would agree that there is a mixture of accuracy and inaccuracy (Meyers 1979: 686-702; cf. Broshi 1982: 379-384). Benjamin Mazar remarks that Josephus is accurate, on the whole, in his description of Jerusalem (Mazar 1982: 1-5). Although Josephus seems quite accurate when compared with archaeological discoveries of his time, he cannot be fully relied on for that which transpired before his time. For a more complete discussion on Josephus and archaeology, see Louis H. Feldman (1989: 435-440).
CHAPTER VI

EARTHQUAKE PARADIGM: A PROPOSAL

The preceding chapters have presented various archaeological, geological, seismic, and literary contexts which contribute to our identification of an eighth century B.C. earthquake destruction at Tel Gezer and the comparative evidence of several other sites in Israel.

Michael Schiffer (1987), who has recognized the significance of "formation processes" in the interpretation of the archaeological record, maintains that earthquakes "can contribute importantly to the formation of the archaeological record" (1987: 231). But which identifiers indicate which process/es caused the deposits as found by the archaeologist in the present? Furthermore, how will the archaeologist distinguish between deposits caused by different formation processes, whether cultural or natural?

The purpose of this chapter is to provide a synthesis of the archaeological, geological, and literary aspects of this study in order to propose an earthquake paradigm that will represent each of these given areas. Special attention is given to the archaeological data since this is where most of the problems in interpretation seem to be founded. The
synthesis will be structured in order to (1) analyze the data of the material culture which is available in the record excavated by the archaeologist, (2) integrate it with the seismological-geological record, and (3) investigate possible relationships with literary sources. This endeavor is designed as a proposal for proper earthquake observation and a methodology in the interpretation of the remains of all areas of research that will be sensitive to natural destruction by earthquake.

Varieties of Formation Processes

Material remains available for interpretation at archaeological sites have undergone various types of change in their different formation processes. Some of these formation processes may have been cultural (human-produced) while other processes have been natural (environmental) (Winterhalder 1980; Schiffer 1987).

Each of these formation processes are expected to display specific lines of evidence in the archaeological record to support them. For example, a destruction level caused by siege and war is normally expected to demonstrate evidence of burning, calcined stones, traces of collapsed walls and undermining, and evidences of battering or forcing the wall inward (Dever in press a).

The formation process of abandonment and the resultant slow deterioration of a given site is expected to display other characteristics than those of rapid destruction. The
absence of any number of expected characteristics should point to an alternative hypothesis for the destruction of a given stratum.

Several scholars have pointed out the difficulty of assessing ancient seismic activity in the archaeological and geological record (cf. Karcz and Kafri 1976; 1978; Russell 1980; 1985; Rapp 1986). Karcz and Kafri (1978: 251) maintain that poor construction and other geotechnical factors may have affected sites making such distinctions difficult. Dever (in press a) mentions the need for establishing "a full-scale theoretical and practical paradigm for dealing with archaeological destructions" This has not yet been provided with regard to seismic destruction, and in this chapter an attempt is made toward that goal.

An Earthquake Paradigm

One result of this investigation of the archaeological sites with earthquake evidence from the first half of the eighth century B.C. (chapters 2 and 3), the geological contexts (chapter 4), and the literary references (chapter 5) is that a distinct pattern seems to have emerged which may be used as a basis for developing an earthquake paradigm.

The earthquake paradigm includes three areas that must be examined: (1) material/physical evidence in the archaeological record; (2) wider geological contexts for present and past seismic activity; and (3) the possible mention of such destructions in literary sources of the same
period. Each of these three areas must be examined independently on the basis of their own validity and may then be brought together for general synthesis.

Archaeological Evidence

There are several features which have emerged from Tel Gezer and other contemporary sites, showing evidence for earthquake activity during the eighth century B.C. These features must be examined: (1) architectural features, (2) pottery/ceramic features, and (3) occupational features.

Architectural Features

Architectural features include the walls, roofs, floors, and other architectural elements in structures/buildings at archaeological sites which were effected by various forms of destruction. The destruction characteristics that these features display should indicate their respective cause.

Dever (in press a) has suggested several possible causes for ancient destructions that could be detected in the architectural features. They are as follows: (1) war and siege; (2) deliberate manmade alterations; (3) accidents caused by man, such as collapses due to poor construction, or fire; (4) natural catastrophes such as forest or brush fires, tidal waves, volcanoes, and earthquakes; and (5) gradual deterioration processes, both human and natural, such as abandonment, robbing, erosion, exposure, etc. This is a
fairly comprehensive list of possible causes of ancient
destrucxtions. The evidence investigated in the preceding
chapters have revealed specific characteristics which lend
themselves for proposing characteristics of a paradigm for
earthquake destruction. They deserve some attention.

The first characteristic of this proposed earthquake
paradigm to be mentioned consists of extensive cracks in walls
and floors. The ashlar insert, along with several ashlar
courses above it in Field XI, Area 20 at Tel Gezer, was split
longitudinally (Dever in press a; Younker 1991). These cracks
could not have been due to subsidence or other geotechnical
causes for the wall was built directly on bedrock (see chapter
2). The situation at Hazor is similar: "Many walls . . . were
found bent and cracked" (Yadin et al. 1960: 24). Also in Room
113 the West wall is cracked and leans eastward (Yadin et al.
1960: 24). Regarding Tel 'Erany, Yeivin notes that Level VI
at Tel 'Erany showed that the "stone-paved floor was split,
its northwest section sinking some 10-15 cm. lower than the
southeast section" (Yeivin 1979: 168).

The second architectural feature which seems to be a
characteristic of the earthquake paradigm proposed consists
of leaning walls.¹ Dever points out regarding Tel Gezer that
"the whole line of stones [comprising the 'Outer Wall'] were
tilted outward at an angle of ca. 10-15 degrees" (in press a).
This tilt or leaning of the two upper walls could not have
been due to subsidence since they were built securely on a
solid LB IIB wall which served as their foundation. The LB IIB wall was built directly on bedrock and did not reveal any evidence of tilting. It was already buried in debris when the earthquake struck. Furthermore, the replastering of the tenth century B.C. wall reveals that this was an attempt to prevent undercutting of the wall by erosion after the earthquake took place (Younker 1991: 30-31).

In some cases at Hazor "the upper part of the wall collapsed and the lower part remained standing but leaning. Leaning walls were used as foundation for Stratum V when rebuilding began" (Yadin et al. 1960: 24).

The third characteristic that supports an earthquake paradigm can be deduced from the manner in which stones topple from the tops of walls. At Tel Gezer large stones were found along the inside face of the "Outer Wall". They seem to have "rolled off backwards, away from the tilt [of the wall]" (Younker 1991: 28). The stones seemingly "had violently 'jumped' off their foundations" (Dever in press b). Stones that fall from walls due to slow deterioration are expected to fall off toward the tilt and down the slope of the hill as gravity demands. At Tel Gezer, however, these stones fell in the opposite direction, indicating a violent movement of an earthquake that toppled the stones in the opposite direction of the tilting of the wall.

The fourth architectural feature of the proposed earthquake paradigm is found at Hazor where courses of wall
were deposited on top of each other course on course. The excavator of the respective find at Hazor indicated that "debris of walls lying course on course" (Yadin et al. 1960: 24). This feature seems to indicate that the walls had suddenly collapsed at the same time, falling one on top of each other.

The fifth architectural feature of the proposed earthquake paradigm is the sudden collapse of ceilings. All rooms at Hazor revealed large amounts of "debris comprising lumps of plaster" (Yadin et al. 1958: 23). Evidently these "lumps of plaster" derived from collapsed ceilings similar to those found in Storeroom 148 in 1956 (Yadin et al. 1958: 23).

A major characteristic which the above features share in common is the sudden nature of the destruction. At Lachish, "the large quantities of pottery, both intact and broken . . . [were] an indication of sudden destruction" (Ussishkin 1977a: 43). Younker summarizes that "Only a very rapid tilting of the wall . . . could cause these upper stones to roll off backwards, away from the tilt" (Younker in press). At Hazor sudden, complete destruction is documented as well as "the entire wall collapsed at once" (Yadin et al. 1960: 24).

These phenomena when observed by excavators should lead immediately to a consideration whether the destruction was caused by seismic activity from an earthquake. Caution as always should be in order. All possible factors need to
be carefully considered. Among them are construction techniques, soil conditions, geomorphological factors, and other aspects which may allow for a variety of formation processes. However, when all formation processes are tested in their proper contexts and relationships, the characteristics cited above from the eighth century earthquake example may lead to the conclusion that the sudden destruction is caused by seismic activity.

**Pottery/Ceramic Features**

There are some sites in which earthquake destruction levels may provide more specific definitions for assessing the pottery/ceramic material in determining the nature of the destruction in a given strata. At Tel Gezer such evidence was sparse due to the location of the squares along the outside and inside of the "Outer Wall." Other archaeological sites, however, offer certain features on the basis of which earthquake destruction levels may be determined.

Hazor demonstrated that several vessels were buried beneath the fallen debris caused by the sudden destruction (Yadin et al. 1960: 24). Upon examination of the respective plates (Pl. IX, 3, 4) it must be noted that the vessels seem to have been broken and remain in such a state *in situ*. Some pieces were rather large and not completely crushed.

At Lachish similar characteristics were found in Level IV of Area S. Ussishkin states, "Many of the floors of the main building were covered with relatively large quantities
of pottery, including both intact and broken vessels" (1977a: 43). Apparently the seismic activity of the earthquake caused pottery to be moved around. In the process, some vessels were broken while other vessels withstood the violent movement of the earthquake.

These observations regarding the pottery/ceramic matter may suggest more specific definitions and interpretations for ceramic analysis of an earthquake destruction, (i.e., large quantities of larger pieces of pottery found in situ and covering a larger area). Once again any conclusions regarding the pottery/ceramic data must be based upon a larger context of geological, seismic, and archaeological evidence.

Occupational Features

The occupational features refer to characteristics that are associated with everyday life during the time period of excavation. Various questions need to be raised regarding occupational features. How did people react after a given destruction took place? What did they do? What changes occurred as a result of the destruction?

Reactions of the survivors of a destruction would be expected to vary with the type of destruction that occurred. For example, in the case of war with the resultant extensive loss of life through death and/or deportation frequently associated with ancient warfare, the surviving community may need considerable time to readjust to normal life patterns, the rebuilding of their cities, and the reestablishment of
their agricultural/business activities. It is necessary to
determine the recovery period and nature of the occupational
features directly following massive destructive activity.

The major occupational feature of levels destroyed by
earthquake is rapid or immediate reconstruction. In the
case of Tel Gezer, for instance, the replastering of the
"Outer Wall" down to the ground level of that occupation
period followed immediately after the destruction. The quick
replastering was intended "to prevent water from further
undercutting the already tilting wall" (Younker in press).

As regards Hazor, Yadin's report notes that "the damage
done was repaired at once and the buildings were rebuilt by
the former inhabitants, to judge by the astonishing
resemblance between Stratum VI and Stratum V" (Yadin et al.
1960: 26).

This feature is also evident in the city of Jerusalem
where "a new and equally thick wall was built up against the
exterior side of the buckled area as a means of support" (Ben-

Beer-Sheba was also "immediately rebuilt by its
inhabitants" according to Aharoni (1973: 107).

Russell (1985: 50) recognizes that subsequent rapid
reconstruction and repair has not always been associated with
the occurrence of an earthquake even though this was the best
explanation. He uses the example of Ramat Rahel and the
earthquake of 551 A.D. (Aharoni 1964: 15, 41, 121-122) and

A second characteristic of an occupational feature that fits into the proposed earthquake paradigm is the continuation of life as though uninterrupted. This assumes, of course, that the earthquake did not destroy much human life. Ussishkin states for Lachish that although "the lower house of Level III and the rebuilt enclosure wall followed the lines of the Level IV structures, while the Level IV city wall and gate continue to function in Level III; these facts point towards the continuation of life without a break" (Ussishkin 1977a: 52).

The third and final characteristic of an occupational feature that fits into the proposed earthquake paradigm concerns the lack of destruction by fire. While one may certainly conceive that a fire could be started by falling flammable debris from an earthquake, there has been little or no fire evidence at most of the above analyzed sites. At Lachish no signs of fire were detected, with the possible exception of Room H.15:1010 (Ussishkin 1977a: 51). Evidence of fire was also absent or not mentioned at Tel Gezer, Hazor, and Tel 'Erany. More information will have to be gathered to substantiate conclusively that fire is absent or rare in destructions caused by seismic activity.
When earthquake activity is suspected at an archaeological site, certain questions regarding geological and seismological data need to be asked before a conclusive interpretation is reached. What type of ground composition do the structures stand on? Could other geomorphological and geotechnical factors such as slope slip, subsidence, etc., be the cause of similar features? How close is the site to fault lines and rifts associated with seismic activity? These questions may strengthen or weaken an argument of earthquake destruction.

Seismicity in Israel, for example, has been well documented (cf. Vroman 1967; Ben-Menahem; Nur; Vered 1976; Ben-Menahem 1977). In the last 40 years seismicity stations have recorded earthquake activity throughout the region (Shapira et al. 1983; 1984; 1985; 1986; 1987; 1988; 1989). This points toward an active earthquake region that spanned over millennia (Ben-Menahem et al. 1977).

Other areas may not be located in an earthquake prone region. In this case other possible interpretations exist such as poor construction, slow subsidence, slope slip, etc. All of these possibilities should be tested at the site where an earthquake destruction is suspected.

There may be important literary references from the ancient world which may contain vital information regarding
earthquakes. The impact that these sources can have on the interpretation of earthquake destruction has been demonstrated in this study. Archaeologists must be acquainted with these literary sources in order to have a comprehensive model of interpretation that encompasses every possible tool.

As with any other piece of evidence, the one derived from literary sources must be evaluated on its own merits within the framework of the type of literature in which reference is made to earthquakes. The type of literature needs to be evaluated. The proximity of the event described must be considered in terms of the date of the document. It is important to discover whether the earthquake described in the literature is that of an eyewitness account or a tradition that has been handed down.

These questions pertaining to literary sources, when answered, will provide the archaeologist a more comprehensive overview of the data available. All three of the elements mentioned above (archaeological, geological, and literary) provide the basis for the proposed earthquake paradigm.

Proposed Steps of Interpretation

Having investigated a number of fundamental elements of this earthquake paradigm from eighth-century sites in Israel, we need now to move onto a more general level, bringing together the total work of an archaeologist in identifying and describing an earthquake activity level. Several factors need to be carefully and systematically
presented by the archaeologist in describing a possible earthquake destruction at a given site. Every contributing aspect, whether archaeological, geological, or literary, needs to be described and evaluated. The archaeologist as interpreter is in need of a comprehensive and sound methodology with proper controls for interpreting the overall data. Karcz and Kafri provided an outline of appropriate steps in their "proposed scheme of description of suspected archaeoseismic damage" (1978: 251). These geologists assume that the process is but one of "description" but I submit that description is joined also, even in their case, with interpretation. Both cannot be completely separated. The following list reproduces with minimal changes their 15 points and adds three new ones:

1. Location and size of site
2. Main periods of occupancy
3. Age of damaged structures
4. Nature of excavation works (rescue and salvage operation, preliminary, single-season, continuing, etc.)
5. Mode and mechanism of excavation (equipment employed, amount of overburden removed, program of operations, etc.)
6. Extent of excavated area and number and size of the exposed buildings and structures
7. Type and quality of construction of the damaged buildings and structures (i.e., masonry, stone, adobe, etc.; type of cement, reinforcements, and fundamentals)
8. Type of damage (i.e., collapse, oriented collapse, tilting, breakage, subsidence, fractures, and displacement)

9. Extent and distribution of damage across the site (number of damaged elements, change in amount and intensity of damage, direction of features of damage, and any possible alignment of the fallen components, etc.)

10. Occurrence of similar damage at other contemporary sites

11. Differences between the observed features of damage and those characteristic of man-induced damage

12. Physiographic setting of the site (relief, distance from cliffs and slopes, slope characteristics, distance from watercourses and shores, etc.)

13. Type and composition of the ground (i.e., rock, alluvium, clay; depth to bedrock, etc.)

14. Features of recent ground instability (i.e., slides, creep, rockfalls, desiccation cracks, erosion gullies and rills, occurrence of karst features)

15. Structural settings of the site (i.e., distance from faults and seismically active areas)

16. Nature of reconstruction and rebuilding

17. Condition of ceramics and their context in relation to other observed features

18. Literary-historical references to seismic activity of the area (i.e., biblical, rabbinic, and ancient textual references).
Summary

The challenge of assessing archaeoseismic activity remains to the present. Formation processes of different types have affected archaeological sites. Some such features may indicate seismic activity as has been shown above. I have attempted to construct a proposal for an earthquake paradigm for assessing and interpreting unique features in given strata which cannot properly fit into the normal destruction patterns used so widely in present-day archaeology. I have built my paradigm solely on destruction levels in Israel that have been assigned by archaeologists to seismic destruction from the eighth century B.C. The paradigm suggested is built on architectural features, pottery/ceramic features, and occupational features. It is corroborated through literary evidence and supported by archaeoseismic studies which reveal continuing earthquake activity in that region for about 4,000 years. The suggested paradigm combines archaeological, geological, and literary data for the interpretative enterprise in modern archaeology.

This earthquake paradigm is designed to assist in answering some of the difficult and unique questions regarding the interpretation of various destruction levels, thus allowing scholars of all disciplines to better understand the nature of destruction at sites with their respective strata/levels throughout Israel, advancing the methodologies used to describe and interpret archaeological sites.
1. Russell (1985: 52) suggests that walls and columns may tilt in the opposite direction of the earthquake epicenter. He refers to the earthquake of Kurion (Soren and Lane 1981; Soren 1981).

2. For similar conclusions about reconstruction immediately following earthquake destruction, see Russell 1980; 1985.
CHAPTER VII

CONCLUSIONS

This study of the earthquake, discovered in the summer of 1990 at Tel Gezer and dated by some to about 760 B.C., has been put in a larger context. One of these contexts includes a study of earthquake destruction at such sites as Hazor, Tel 'Erany, Lachish, Jerusalem, Beer-Sheba, and possibly Arad, and Samaria.

In conclusion it may be summarized that (1) the features at Tel Gezer can be normally interpreted as resulting from seismic destruction and not other geomorphological or geotechnical factors; and (2) it may be suggested that this destruction was not localized but extended throughout Israel affecting sites in the North (Hazor), in the Shephelah (Gezer, Lachish, and Tel 'Erany), possibly in the Judean hill country (Jerusalem), and in the southern Negeb (Beersheba and Arad).

It is agreed that the respective earthquake destructions at Hazor, Tel 'Erany, Lachish, and possibly Beer-Sheba have been dated by excavators to between 765 and 749 B.C. The dates of Hazor and Lachish are derived by the excavators on the basis of the literary evidence found in Amos 1:1 and Zech 14:5. The date for the destruction at Tel 'Erany
is deduced from the writings of Josephus. It has been shown that the destruction level under dispute at Arad may have been caused indeed by an earthquake since seismic activity is demonstrated for the Negeb. Beer-Sheba, also located in the Negeb, shows earthquake destruction during this same period. The suggestions regarding Jerusalem remain uncertain and have not been precisely dated.

In the context of the careful study of biblical and extra-biblical literature (chapter 5) it was concluded that the extra-biblical literature is dependent on the biblical literature with the exception of additions in Josephus for which there is no historical support. Thus the best historical evidence for the earthquake under discussion from literary sources comes from the contemporary record in the book of Amos. Based on a careful textual study of the literary evidence, the earthquake mentioned in Amos is an actual historical event. The chronology provided in Amos 1:1 indicates that the earthquake may have taken place any time between 791 and 753 B.C. There is no need, on the basis of the internal literary evidence in Amos, to date the earthquake to the closing part of this period of time. In other words, an earlier date than 765 should not be ruled out (pace Yadin and others).

The eclipse of the sun referred to in Amos 8:8, associated in an earthquake context may assist in providing another linkage to a natural phenomenon that may assist in
establishing an absolute date. Based on the evidence provided, there are several possibilities to select for the eclipse of the sun of Amos 8:8, such as the years 791, 784, 777, 770, 763 B.C. in which eclipses of the sun took place. Thus the widely cited eclipse of June 15, 763 is only one of the possibilities. The astronomical data for the eclipse leaves about as wide a span of time for the earthquake to have taken place as the chronology of the kings provided in Amos 1:1.

This study into the seismicity of Israel (chapter 4) has indicated that there are massive N-S and E-W fault-directions due to the Afro-Eurasian junction. These fault systems have caused extensive seismic activity for the past 4,000 years. Maximum earthquake magnitudes associated with the Jordan rift are suggested to be between 7.5 and 8 on the Richter scale. This reveals that extremely severe earthquakes with massive destructions seem to have taken place. Geological considerations support the idea of earthquakes affecting the entire area of Israel.

In the final chapter an earthquake paradigm has been proposed that takes into consideration the work of archaeologists, geologists, seismologists, and scholars of literature -- that is, an interdisciplinary approach. This proposal goes beyond the paradigms currently available.

An earthquake can contribute significantly to the formation processes of the archaeological record. A neglect
of the natural, or environmental processes in site formation is detrimental to the proper interpretation of the archaeological data. It is, therefore, important to be aware of earthquake formation processes in addition to socio-cultural formation processes. Information from literature that is relevant to such formation processes is of vital importance in the conceptualization and development of a wholistic paradigm.

The proposed earthquake paradigm is based on the evidence produced from this study of (1) architectural, pottery/ceramic, and occupational features of archaeological sites; (2) geological and seismographic information; and (3) relevant literary sources. These three sources of information and their mutual interpretative values provide the basics of the proposed paradigm.

This thesis has attempted to make a contribution in regard to placing the recently discovered earthquake at Tel Gezer from the first half of the eighth century B.C. into a larger framework and contextual setting. The proposed paradigm may stimulate further work along similar lines in other archaeological sites, periods, and contexts. Archaeology needs to become more aware of larger connections and greater varieties of formation processes as it engages in fieldwork and interpretation procedures for data uncovered.
Plate 1. Map of Israel, showing the location of sites affected by the 8th century B.C. earthquake.
Plate 3a. See caption for Plate 3b.
Plate 3b. (1) Inner face offset of Outer Wall (Macalister's "Tower VII") founded in 10th century B.C., (2) remodelled and destroyed by earthquake in 8th century B.C.
Plate 5a. See caption for Plate 5b.
Plate 5b. Three phases of outer face of Outer Wall -- (1) upper, 9th/8th century B.C.; (2) middle, 10th century B.C.; (3) lower, LB IIB.
Plate 6. Top plan showing the relationship of Areas 20, 21, and 22 which show evidence for earthquake destruction.
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