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章）英汉翻译实践报告

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A Report on the E-C Translation Practice of
***Volcanoes in Human History* (Chapters 2)**

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Translation and Interpreting
In English Translation

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摘 要

本次翻译实践选自导师承接的翻译项目《人类历史上的火山：大喷发的深远影响》（*Volcanoes in Human History: The Far-Reaching Effects of Major Eruptions*）一书，该书为江苏人民出版社“同一星球”系列作品中的一部，属国内首译。原作于 2005 年由普林斯顿大学出版社出版，作者是杰勒·泽林加·德布尔（Jelle Zeilinga de Boer）和唐纳德·西奥多·桑德斯（Donald Theodore Sanders）。全书共分十章，讲述了火山对人类历史文化的影响。本人负责第二章的初译与审校。这一章不仅叙述了夏威夷火山的成因、构造、危害等，还着重讲述了火山对夏威夷历史、社会和文化的影响。本书含有大量火山地质专业术语和专业知识，也包含大量文化信息，作者通过诗歌、小说选段、神话故事等来帮助读者理解火山事件对人类社会的影响，源文本属于信息型和表情型复合文本。

在翻译过程中，文化负载词的补偿、语义内容的连贯，以及文学引文的“达”意是本篇实践报告的重点。遇到文化负载词，译者用文中或者文内注释补充了原文信息。这种方式尊重原文，对原文损害小，也能将背景信息传达给读者。对于语义内容不连贯的情况，译者通过逻辑性增补词、词义引申、词汇衔接和句式重构保持语义内容连贯，使译文通顺，从而提高可读性。针对文学引文，译者以严复的“达”为标准，通过互文性和修辞手段，发挥译语优势，使文学引文达意。

通过本次翻译实践和案例分析，笔者对如何补充解释信息、如何

实现语义连贯，以及如何巧妙地处理文学翻译都有了更深的理解。译者认识到，简单的直译只会导致“死译”，造成语句不通且缺乏感染力。译者应结合语境和文化背景，选择恰当的翻译方法，实现源语与译入语的功能对等。笔者希望本篇实践报告能为其他相关译者提供参考。

关键词：《人类历史上的火山》；词义引申；文化负载词；逻辑性增补词；文学引文翻译

Abstract

The translation practice is based on a translation project undertaken by my tutor, *Volcanoes in Human History: The Far-Reaching Effects of Major Eruptions*. The book is the first Chinese version of the “One Planet” series by Jiangsu People’s Publishing House. Written by Jelle Zeilinga de Boer and Donald Theodore Sanders, the book was released in 2005 by Princeton University Press. It contains ten chapters discussing how volcanoes have influenced human history and society. The translator is responsible for the initial translation and proofreading of Chapter Two, which concentrates on the effects of volcanoes on Hawaii’s history, society, and culture in addition to describing the origin, structure, and dangers of Hawaii’s volcanoes. There are many volcanic terminology and professional knowledge, as well as a large amount of cultural information. The author uses poems, literary quotations and mythology to help readers comprehend the impact of volcanic occurrences on human beings. The source text is a composite text that combines informative and expressive text.

During the translation process, the compensation of cultural-loaded words, the coherence of semantic content and expressiveness of the literary quotations are the three main challenges confronted by the translator. To compensate for the cultural-loaded words, the translator supplements the information in the original text with notes or in-text

annotations, thus the source text is respected and minimally harmed and background information appropriately conveyed. For the semantic incoherence, the translator employs logical word addition, extension of meaning, lexical cohesion and reconstructing sentence patterns to maintain the coherence. This smooths the translation and enhanced its readability. For literary quotations, the translator carefully follows Yan Fu's "expressiveness" as a standard, uses rhetoric means and intertextuality to make the literary quotations smooth and expressive.

Through the translation practice and case analysis, the translator has a better knowledge of how to complement information, achieve semantic coherence and skillful handling of literary translations. Besides, the translator realizes that literal translation often leads to "mechanical translation", which is inconsistent with the Chinese expression, resulting in unsmooth and unattractive translation. Therefore, translators should consider the context and cultural background, choosing the appropriate translation method to achieve functional equivalence between the source language and the target language. Finally, the translator hopes the report can provide a reference for translators working with the same type of text.

Key Words: *Volcanoes in Human History*; extension of meaning;
cultural-loaded words; logical word additions; translation
of literary quotations

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Chapter 1 Introduction

1.1 Task Background

The material for the translation practice is selected from the book *Volcanoes in Human History: The Far-Reaching Effects of Major Eruptions*, a translation project undertaken by my tutor. The book is from the “One Planet” series works by Jiangsu People’s Publishing House. It is the first translation in China. The original book was published by Princeton University Press in 2005 and written by Jelle Zeilinga de Boer and Donald Theodore Sanders. The book consists of ten chapters and the translator is responsible for the initial translation and review of Chapter Two. There are 8,000 words in the source text and 14,000 words in the target text, which meet the dissertation requirements.

1.2 Text Introduction

The book is about volcanoes and the role they have played in human history. In addition to their immediate impact on the natural environment, volcanoes also have an impact on social life, customs, and human psychology, which reveals the intrinsic connection between the earth sciences and the humanities. This ten-chapter book addresses nine volcanic eruptions, including huge eruptions, such as Italy’s Mount Vesuvius, Indonesia’s Krakatoa, and Hawaii’s volcano, etc.

Chapter two explores the relationship between volcanoes and human history through the eruptive history of Hawaii’s volcanoes. For example, the plate activity of the Hawaiian Islands is very similar to the action of the fire goddess Pele according to local myths. The author excerpts from poetry, fiction and mythology to help readers understand volcanic activity. The book contains a wealth of professional terminology and knowledge in volcanic geology, as well as a great deal of cultural information, belonging to composite text.

1.3 Practice Significance

Firstly, the translation practice helps the translator to improve her skills in using CAT software. In the translation process, memo q, X bench, and snowman software are used, which can proofread the translation and improve efficiency. The translator establishes the volcanic and Hawaii place name glossary, which can provide a reference for other translators. It also lays the foundation for the translator to master the skills in future work.

Secondly, the translator has expanded his knowledge of volcanoes and Hawaiian culture. The source text belongs to humanities and social science works, containing a large amount of historical and humanistic knowledge. After reading and searching for relevant information, the author has gained a deeper understanding of this field than before. This enhances the translator's knowledge reserve.

Thirdly, the practice helps improve the translator's ability. The source text contains descriptive procedures and cultural content. Before translating, the author must ensure that the information and comprehension are accurate. Therefore, translators need to thoroughly understand the content, from word meanings to discourse connections. Different translation strategies for different types of texts. Through the process of questioning and modifying the translation, the translator's ability is improved.

Chapter 2 Pre-translation Preparations

Front works must make the full preparation. Preparation is a necessary step to solve the problems in the translation process. It can help translators determine the translation style, unify terminology and improve efficiency. The preparation work includes: analyzing the features of the source text, establishing a glossary, and choosing translation tools and parallel texts.

2.1 Analysis of the Source Text

“Text analysis for translation is actually to analyze the pragmatic functions of languages in a certain context and adopt appropriate translation strategies according to the intended function”(张美芳,2014). Text analysis can play a guiding role in the translation process. By determining the author’s writing purpose, style, and target audience, translation strategies can be found to guide the translation process.

Katharina Reiss (2014) divides text types into the following three categories: expressive, informative and operative text. Expressive texts, such as poetry, drama, etc., focus on the expression of emotions, which tends to be faithful to the original text. Informative texts, such as reports, lectures, etc., focus on accurate communication of the content and generally use a simple translation style. Operative texts, such as advertisements and campaign speeches, aim at infecting readers and viewers and focus on the feedback and reaction of the target readers.

The source text belongs to the humanities and social sciences category. According to Reiss’s text typology, the translator classifies it as a composite text of informative and expressive. The source text contains not only expressive text such as literature, poetry and mythology, but also informative text such as geological terminology and professional knowledge. When dealing with expressive texts, efforts should be made to maintain the form and aesthetics of the source text. When dealing with informative texts, the most important thing is that the information is conveyed accurately and smoothly. The source text is concisely worded and describes the

subject matter in an objective and down-to-earth style. It is not an obscure book, the translator should make the translation easy to understand, especially to make the logic of the source text clear.

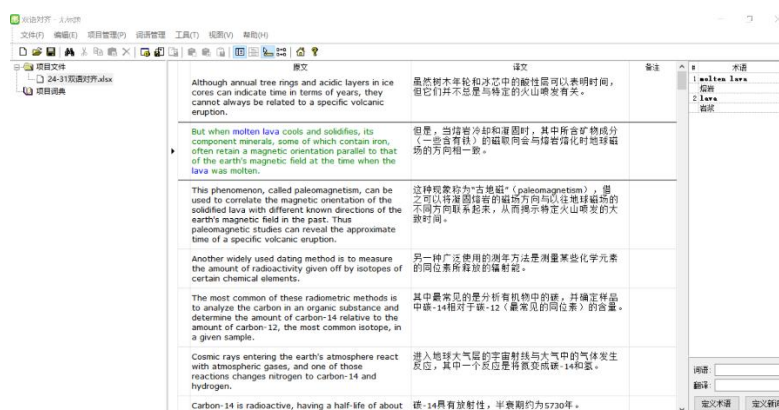
2.2 Establishment of Glossary

The emergence of memory banks and glossaries can ensure the consistency of terms in the previous and subsequent translations, avoiding repetitive work. Therefore, for large-scale translation projects, a CAT tool that can provide precise terminology and sentences can greatly improve the efficiency of the project. (冉倩,2021) The publisher requires that the terminology and proper names need to be consistent. To ensure the unity of terminology and avoid understanding differences with the group members, the names of places, people and proper nouns in the translation practice are made into a glossary.

Firstly, the English and verified Chinese of the terms were filled into an Excel table and saved in XML format. Then, the translator creates a terminology project in the Snowman software and imports the file into it. The Excel glossary can be imported into the terminology project. After the terminology glossary is built, it can be proofread and modified line by line.

A	B
1 aa (ah-ah)—Hawaiian term for rough, clinkerlike lava (cf. pahohoe).	aa(啊啊) - 夏威夷语,粗糙的熔岩块(参见 pahohoe).
2 aerosol (air-o-sol)—a suspension, in the air, of liquid droplets or of solid particles.	aerosol(气溶胶) - 空气中的悬浮或固体微粒的悬浮体。
3 archipelago (ar-ke-pel-a-go)—a large group of islands, or an area of a sea that contains many islands.	archipelago(群岛) - 一个由许多岛屿组成的大型群岛,或者一个海域中存在许多岛屿的区域。
4 ash (see volcanic ash).	ash(见火山灰)。
5 asthenosphere (as-theen-o-sphere)—a ductile layer in the upper part of the earth's mantle.	asthenosphere(软流圈) - 地幔中塑性的一层(参见地幔);它呈塑性流动,被认为是形成岩浆(参见岩浆)。
6 asthenosphere wedge (see mantle wedge).	asthenosphere wedge(软流圈楔体/见地幔楔体)。
7 atoll (at-all)—a coral reef that encircles, or nearly encircles, a central lagoon.	atoll(环礁) - 一个环绕或近乎环绕中央泻湖的珊瑚礁。
8 avalanche—a mass of rock, soil, ice, or snow, or a mixture of those materials, falling or sliding down a slope.	avalanche(雪崩) - 由岩石、土壤、冰雪或这些材料的混合物组成的大量物质从山坡或山坡滑落(参见雪崩)。
9 basalt (ba-salt)—a dark-colored rock (solidified lava) that contains little silicon.	basalt(玄武岩) - 一个含有较少硅的暗色岩石(固化的熔岩,参见熔岩)。
10 base surge—a cloud of gas or suspended solid debris that rapidly moves outward from a volcano.	base surge(基岩冲击云) - 从喷发柱基部快速向外移动的气体或悬浮固体碎屑的云(参见冲击云)。
11 bomb (see volcanic bomb).	bomb(见火山弹)。
12 calcite (kal-site)—a common rock-forming mineral (q.v.) composed of calcium carbonate.	calcite(方解石) - 一种普通的岩石形成矿物(参见矿物),由碳酸钙组成。
13 caldera (col-dare-uh)—a large, more or less circular volcanic depression, much larger than a cinder cone.	caldera(火山口) - 一个大型的、或多或少呈圆形的火山凹陷,远大于火山山口(参见火山口)。
14 carbon-14—a radioactive carbon isotope (q.v.) that has a mass number of 14 instead of 12.	carbon-14 - 一种放射性碳同位素(参见同位素),质量数为14,而不是正常的12。
15 chamber (see magma chamber).	chamber(见岩浆室)。
16 cinder (volcanic)—a small fragment of material erupted by a volcano.	cinder(火山灰) - 由火山喷出的小块材料。
17 cinder cone—a conical hill formed by an accumulation of volcanic cinders and other debris.	cinder cone(火山锥) - 由火山灰和其他碎屑物的积累形成的锥形小山。
18 conduit (see volcanic conduit).	conduit(见火山喉管)。
19 cone (see cinder cone, spatter cone, volcanic cone).	cone(见火山锥、喷发锥、火山锥)。
20 coral—hard material composed of many calcium carbonate skeletons of tiny bottom-dwelling animals.	coral(珊瑚) - 海洋中许多微小底栖生物(珊瑚)的钙质骨骼形成的坚硬材料。
21 core (of the earth)—the central part of the earth's interior, thought to be divided into a core and a mantle.	core(地球核) - 地球内部中心部分,被认为是分为固体内核和液体外核。
22 core (see drill core, ice core).	core(见钻孔岩芯、冰芯)。
23 crater (volcanic)—a depression, usually at the summit of a volcanic cone or mountain.	crater(火山口) - 通常位于火山锥或火山山顶的一个洼地(参见火山口)。

(Bilingual Terminology in Excel)



(Application of the Glossary in Snowman Software)

This method can ensure the consistency of the terminology, avoid personal limitations and improve translation accuracy. The glossary helps translators to improve efficiency. At the same time, making a glossary can enable group members to help each other and cultivate cooperative awareness.

2.3 Selection of Translation Tools

To achieve success in a task, one must first prepare the necessary tools and equipment. With the rapid development of modern technology, translation tools can increase efficiency and help translations. The source text contains many terms, such as personal names, place names, and cultural information, which require assistance from websites, books, translation tools, and ChatGPT.

Wikipedia, Google search, Volcano Knowledge Base (volcano.org.cn), and dictionaries: *Dictionary of Translations of World Names* and *Handbook of Translations of World Geographical Names* help with translation. Not all information on the website is true, translators should refer to published books which more accurate. However, the storage capacity of books is limited, websites can be used.

Translation software, such as DeepL, Youdao and Microsoft Translation, can proofread and provide ideas in the translation process. However, translation software is very limited. It has difficulty in understanding the logic of the source sentence correctly and has trouble with sentences that have a lot of subordinate clauses, adverbs, and adjectives. Memo Q can improve translation efficiency. Translators can import the glossary made by Snowman Software into Memo Q. The translation of the

source text is very clear, and there will be no missing translation. There are several online translation software on the page to simplify the process of translating. The quality assurance function of Memo Q can help translators to proofread.

ChatGPT is the most popular artificial intelligence software nowadays. It has very powerful text comprehensive and generated ability, supported by a rich corpus. It can answer different types of questions. At the same time, it also has limitations. After using it, it was found that the information of the software comes from corpus, including news, books, papers and social media. Therefore, the information it provides is not always accurate. Since ChatGPT has a wide range of information sources, it can inspire translators to solve problems. For example, *kapiolani* is a rarely known poem by Tennyson. It is difficult to retrieve the information on the website, but ChatGPT can provide some clues. When the translator deal with missing cultural information and unclear meanings of specialized terms, the answers given by ChatGPT are very informative. However, the reliability of the information needs further checking by the translator. It was only when the translator continued to search through the clue that she gained a deeper understanding of the poem.

2.4 Collection of Parallel Texts

Translators should have a wealth of knowledge to cope with the different types of texts in every translation challenge. However, it is difficult for translators to have a comprehensive knowledge of different fields. Therefore, how to deal with a large number of specialized terms is a test for the translator.

In addition to domestic and foreign search engines and translation software, parallel texts can help translators understand the source text deeply and accurately. The translator has collected some encyclopedic series and documentaries, such as *Volcanoes and Earthquake*, *Exploration Volcano*, and *Prediction and Early-Warning of Volcano*, whose contents greatly help this translation practice. The published books are authoritative, so they can provide very reliable references. Documentaries can enhance the translator's understanding of the content through pictures and video. The

parallel text is helpful in the construction of the glossary. The translator can understand volcanic eruption and formation process deeply.

Thus, the authentic and accurate information benefited the translation. Parallel texts make the translation professional and worthwhile reference.

Chapter 3 Case Study

This chapter shows how the translator analyzed and solved the difficulties in the translation process. It focuses on the following aspects respectively: compensation of the culture-loaded words, coherence of semantic content and expressiveness of the literary quotations. Specific translation methods are presented to solve these problems.

3.1 Compensation of Culture-loaded words

Owing to differences in geographical location, social system, religious beliefs, historical background and so on, different ethnic groups have formed their own cultural traditions, which are naturally reflected in their languages. Language embodies the wisdom and history of mankind and reflects the spirit of a nation. Geographic environments make up Hawaii's unique ethnic characteristics and culture. When it comes to elements with local characteristics, compensation should be made. Nida (1964) considered, "...unless a translation makes sense to the receptor, it has not justified its existence." Therefore, to convey the cultural information and terminology, it is necessary to take corresponding measures.

3.1.1 Annotation outside Text

Cultural context plays an extremely important role in translation. Without understanding the relevant context, the translation cannot be faithful to the original. Therefore, the translator must have considerable cultural knowledge and understand the cultural background or context of the source language(李伟,2006). When translating classical or academic works, translators generally pay more attention to preserving the multiple meanings of the source text, including the literal meaning. Therefore, the method of annotation outside text is more often used to compensate for the loss of meaning. It can reduce the reader's confusion and misinterpretation.

Example 1:

ST: The people both feared and respected Pele, and they tried to assuage her capricious temper with offerings of food and small animals, along with garlands of flowers, called leis, and **sacred ohelo berries**.

TT1: 人们敬畏佩蕾，指望着供奉食物、小动物、颈上花环（leis）和**神圣的奥赫洛野莓**来安抚她反复无常的脾气。

TT2: 人们敬畏佩蕾，想通过供奉食物、小动物、花环（leis）以及**圣果奥赫洛（Ohelo）野莓**来安抚她反复无常的脾气。

脚注: 奥赫洛野莓果：被夏威夷人视为圣果。当地人会将浆果扔向佩蕾在大岛上的家——基拉韦厄方向。据说奥赫洛是佩蕾的姐姐化身而成。这位女神在临死前让儿子把自己埋在母亲的肚脐上，也就是基拉韦厄山顶。儿子照做后，她就化身成野莓果树，树以她的名字命名。

Analysis: The key point here is how to compensate for the meaning of Ohelo, which is not an ordinary fruit. Its origin is related to the mythological story of the volcano. Since the reader does not have the cultural background knowledge, and cannot resonate. There will be a vacuum of sense when translating it. If directly translated as “神圣的奥赫洛野莓”, the source text and the target text seem to correspond in form and meaning. But the translation is pale and powerless. It only achieves the superficial equivalence. It is necessary to explain its origin to target language readers as culturally loaded information. After checking through Chat GPT, the following information was obtained: the sacred fruit of Ohelo is regarded in Hawaiian legend as a symbol that can bring good luck, protection, and a connection with the gods. Legend has it that Ohelo was incarnated by Pele's sister. Before she died, she asked her son to bury himself in his mother's navel, which is at the top of Mount Kilauea. She incarnated as a wild berry tree and the tree was named after her. This explains why the fruit was given the title “sacred”. The word appears several times in the text. It is necessary to add this background knowledge in a footnote.

Example 2:

ST: Twain had something to say, too, about the sound and even the smell of lava: “the noise made by the bubbling lava is not great... It makes...a rushing, a hissing, and

a coughing or puffing sound... **The smell of sulfur is strong, but not unpleasant to a sinner.**”

TT1: 马克·吐温还提到岩浆的声音甚至味道：“冒泡的岩浆发出的声音并不大，那是一种急促、嘶嘶、咳嗽或喷嚏般的声音。硫磺的味道很浓，但对罪人来说并不难闻。”

TT2: 马克·吐温还提到岩浆的声音甚至味道：“冒泡的岩浆发出的声音并不大，那是一种急促、嘶嘶、咳嗽或喷嚏般的声音。**硫磺的味道很浓，但对罪人来说并不难闻。**”

脚注: 在《创世记》和《启示录》中，硫磺是上帝的惩罚手段，代表上帝对罪恶之人的惩罚和警告。

Analysis: The difficulty at this point is to clarify why the smell of sulfur is unpleasant to a sinner. Without religious knowledge, the reader cannot associate sulfur with sinners. Readers may be confused. In some religions and related cultures, sulfur is associated with crime and sin. The sinner refers to those who have committed a crime and received god's punishment. They can smell a strong smell of sulfur. Therefore, the pungent odor of sulfur that the writer smells would be nothing to those who have sinned. Without annotation, the reader's reading fluency would be affected, so an explanatory note in the footnotes would save the reader from interruption and restore the expression of the source text to a greater extent.

3.1.2 Annotation within Text

Compensation should also be made for terms with cultural characteristics. Translators should help the target language readers to fill in the specific information in the source language. When the additional information is condensed and short, annotation within text can be used.

Example 3:

ST: During these outbursts, droplets of molten lava may cool into globules of volcanic glass known as **Pele's tears**. Often, as they are wafted through the air, the droplets trail glassy threads, which break off upon cooling. Clusters of the spun-glass threads are said to be **Pele's hair**.

TT1: 在这些喷发过程中，熔岩滴可能会冷却成透明液滴，这是“佩蕾的眼泪”。而当它们在空中吹送时，液滴会拖着透明的细丝，遇冷时断裂。那一簇簇的玻璃纤维是“佩蕾的头发”。

TT2: 在这些喷发过程中，熔岩滴可能会冷却成透明液滴，这是“佩蕾的眼泪”（即火山泪）。而当它们在空中吹送时，液滴会拖着透明的细丝，遇冷时断裂。那一簇簇的玻璃纤维是“佩蕾的头发”（即火山毛）。

Analysis: The difficulty here is how to compensate for Pele's tears and Pele's hair and not damage the source text. They are professional and regional vocabulary. The source text has already provided sufficient explanations for it, so the translator does not need to interpret it with footnotes. Annotation within text are sufficient. Readers can know the cultural meaning and professional knowledge. Translators should not overlook the supplement of professional knowledge behind cultural information. Since there are professional nouns in Chinese context, the translator should not be limited to translate them word by word. Volcano Knowledge Base shows that Pele's hair is “火山毛” in Chinese, and Pele's tears is “火山泪” in Chinese. It is necessary to supplement professional knowledge in the translation. In this way, readers can have a comprehensive understanding.

Example 4:

ST: Most lava solidifies into either of two forms of basalt known by the Hawaiian terms **aa** (pronounced “ah-ah”) and **pahoehoe** (“pa-hoy-hoy”), which have been adopted by volcanologists worldwide.

TT1: 大多数岩浆凝固成玄武岩的两种形态，夏威夷人称作 **aa**（读作“阿阿”），另一种叫 **Pahoehoe**（“帕霍霍”），该说法已被世界各地的火山学家采用。

TT2: 大多数岩浆凝固成玄武岩的两种形态，一种夏威夷人称作“阿阿”（**aa**，即块状熔岩），另一种叫“帕霍霍”（**Pahoehoe**，即绳状熔岩），该说法已被世界各地的火山学家采用。

Analysis: The emphasis in this example is on the use of annotation within text dealing with the terminology “aa” and “pahoehoe”. Aa stands for “块状熔岩”, or “阿

阿” in the local language, meaning “thorny”; pahoehoe stands for “绳状熔岩”, meaning “smooth”. It was introduced into the terminology of volcanology by Dutton in 1882(张根寿,2010). The original text adds the Hawaiian pronunciation and later describes the two terms specifically. In addition to the Hawaiian language, the terms in geology should also be supplemented here. Therefore, not only the pronunciation should be shown, but also the specialized terms should be provided to the readers. The source text provides additional explanations of pronunciation in the sentence, so the in-text annotations should be added. Neither destroying the source text nor making huge changes, but also considering the reader’s awareness.

3.2 Coherence of Semantic Content

The translation is, in a sense, a coherent reconstruction. In the process of understanding, the translator must first find out the specific coherent vein of the source text, and then the translator can make a reasonable sorting and interpretation of the meaning(王东风,2009). This section analyzes the sentence order, implicit relationships within and between sentences in the original text, and achieves logical and semantic consistency through logical word addition, extension of meaning, lexical cohesion, and reconstructing sentence patterns.

3.2.1 Addition of Logical Words

Logical word additions refer to the components that are added when the meaning is transformed into a morphological correspondence, i.e., succession, transition or echo words(刘宓庆,2019). It is in line with the Chinese language habits and makes the sentence “alive” by adding logical words. Relying only on literal translation can cause difficulties for readers to understand. Adding logical words can optimize the language structure and improve the quality of translation.

Example 5:

ST: Sometimes lava will flow around certain areas and leave them undamaged. These island-like areas, which range in size from a few square meters to many square

kilometers, are called kipukas. Many of them preserve plants from which seeds and spores spread to barren lava fields, where they start life anew.

TT1: 有时熔岩会绕着特定的区域流动, 让它们保持完好无损。这些小岛状的区域, 面积从几平方米到几平方公里不等, 称为“基普卡”(kipukas)。其中保存着植物, 这些种子和孢子传播到贫瘠的熔岩荒野, 在那里重新生长。

TT2: 有时岩浆会绕着特定的区域流动, 但不会对他们造成损害。这些呈岛屿状的区域, 面积从几平方米到几平方公里不等, 称为“基普卡”(kipukas)。由于许多“基普卡”都覆盖着植被, 植物的种子和孢子就会传播到贫瘠的岩浆区, 在那里开始新生活。

Analysis: The key point in this sentence is adding the logical words to smooth out the meaning of the sentence and to reveal the implied logical relationships. The initial translation overly follows the principle of “faithfulness” and places smoothness in a secondary position. Although, the source sentence does not express “但”, “由于”, “就会”. But when the meaning of the source text is understood, the role of adding logical words becomes apparent: transitions and succession. It plays an important role in the coherence and cohesion within a cluster of sentences. According to the cohesion model of Halliday and Hasan, “但” here indicates a transitive relation, “由于” and “就会” indicate causal relations. The problem of word-for-word translations can be avoided by making implicit relationships explicit.

Example 6:

ST: Thus on most older islands there is evidence of two phases of volcanism: a **primary phase** during which the massive shield volcanoes were formed and a minor, **secondary phase** represented mainly by swarms of dikes and surface vents.

TT1: 因此, 在大多数较古老的岛屿上, 有证据表明火山活动有两个阶段: 初级阶段是形成大型盾状火山, 次级阶段主要是形成大量岩脉和表面喷口。

TT2: 因此, 在大多数古老的岛屿上, 有证据表明火山活动有两个阶段: 首先形成巨大的盾状火山, 然后形成大量岩脉和表面喷口。

Analysis: The difficulty here is to bring the reader closer by highlighting order relationships. Initially, a literal translation was used, translating into “初级、次级阶

段”, which appeared to be scientific and rigorous. However, the usage of “首先” and “然后” better reflects the order and subordination that the source text wants to emphasize. The translator believes that the words express order is more in line with Chinese language habits. The language structure is optimized and easier to read. Without destroying the source text, the language and culture of the translated language are respected. Converting nouns into logical words makes the connection between clusters of sentences stronger and improves readability and fluency.

3.2.2 Extension of Meaning

Extension is categorized as general (ST) to specific (TT) or specific (ST) to general (TT). The basic mechanism is to match the purpose is to match the target language or expression habit, or to adapt to a certain context. (刘宓庆, 2019) Sometimes, the translation can seem redundant due to multiple adjectives and adverbs. In this case, extension of meaning can simplify the translation without affecting the meaning of the source text.

Example 7:

ST: The lava merely flowed along beside **the old stream**, however, and rejoined it a short distance downhill.

TT1: 但是, 熔岩只是在之前的熔岩流旁边流动, 并在下坡不远处又汇聚到一起。

TT2: 但是, 熔岩只是在老路旁边流动, 并在下坡不远处又汇聚到一起。

Analysis: The initial translation translates the “old stream” as “之前的熔岩流”, which brings great reading difficulties to the readers. After clarifying the meaning of the sentence, the translator made changes to the initial translation. Through the preceding and following text, it is clear what is being pointed out here, so there is no need for elaborate “之前的熔岩流”. To interpret it as “老路” avoids the complexity of the components, the lack of clarity of the logical relationship, and word-for-word translation. There is a Chinese word for “水路”, so it is possible to translate the flowing lava as “路”. To translate “stream” reasonably as “路” is in line with the Chinese language habit.

Example 8:

ST: **Members of the old faith** tried to dissuade her, fully believing she would die a horrible death if she approached Halemaumau, the fire pit where Pele dwelt.

TT1: 坚持以前信仰的成员试图劝阻她，坚信如果她靠近哈雷茂茂——佩蕾居住的火山坑，就会死无葬身之地。

TT2: 守旧的人们试图劝阻她，坚信如果她靠近哈雷茂茂——佩蕾居住的火山坑，就会死无葬身之地。

Analysis: It is very complex to translate “Members of the old faith” as “坚持以前信仰的成员”, and the concentration in this sentence remains on Pele. In this case, the translator has to reasonably derive the meaning of the words. “坚持以前信仰的成员” can be summarized as “守旧的人们”. This treatment results in a wider range of lexical meanings, which can be well understood when taken in context. This translation is not only fluent but also does not prevent the message of the source text. TT1’s translation, although equivalent to the original, is tedious and inflexible. Sentences become concise and easy to understand after extension of meaning.

Example9:

ST: Namaka o Kahai **reveled in her apparent victory**, but later, from her remote aerie, she looked back toward the island of Hawaii and saw clouds of red-hued smoke rising from a flaming crater atop the high mountain we call Mauna Loa.

TT1: 纳玛卡沉浸在她表面的胜利中，但随后，她在遥远的小屋里回头看向夏威夷岛，看到红色的烟雾从我们称为莫纳罗亚的高山顶上的火山坑中升起。

TT2: 纳玛卡以为自己大获全胜，但随后，她从自己的住处回望夏威夷岛，看到红色的烟雾从我们称为莫纳罗亚的高山顶上兴起。

Analysis: The point of the sentence is to restore the meaning of the source text through extension of meaning. “Reveled in apparent victory” in TT1 is faithful to the source text in terms of information, but it reads confusing. The Collins dictionary definition of apparent is “easy to see or understand” and “that seems to be real or true but may not be”. When analyzed in context, we can see that this kind of “apparent victory” actually means “以为自己胜利了”. In addition, the translation of “victory”

as “大获全胜” effectively conveys the source text and contributes to the smoothness of the translation. Therefore, the translator extended the meaning of the word.

Example 10:

ST: Almost all of them have long since had their brief time in the air, and have been returned by erosion and seafloor subsidence into the **fathoms** from which they arose.

TT1: 就像缝纫机的针穿透移动的布料一样。……几乎所有的岩浆热都曾在空中短暂停留，并最终因侵蚀和海底沉降回到他们的原来的**英寻**。

TT2: 就像缝纫机的针穿透移动的布料一样。……几乎所有的岩浆热都曾在空中短暂停留，并最终因侵蚀和海底沉降而返回它们的来处——**深海**。

Analysis: Sentences here are quoted from the novelist John McPhee’s description of magmatic heat. Fathom is defined in Collins as a linear unit of measurement (equal to 6 feet) for water depth. TT1 is literal translation of the source text, but the translation is unreasonable. On reflection, the translator believes that “returned into the fathoms” is not an accurate description. What the original authors were trying to show was that magmatic heat was back to the ocean. Besides, this passage comes from a novel and belongs to the expressive text. When dealing with this text, the translation should reflect the beauty of the language based on the accuracy of the information. The translation of “fathom” into “深海” brought the linguistic advantages of Chinese into full play.

3.2.3 Lexical Cohesion

Halliday and Hasan (1976) categorize lexical cohesion into two main groups: reiteration and collocation. Reiteration is the return reference of a generalized word to a particular lexical item. Collocation is words that are co-occurring are semantically linked and are often used in the same text (胡壮麟, 2005) A discourse should have a main idea, centered around a particular area or topic. When that topic is addressed, there will inevitably be some directional vocabulary. Lexical articulation allows the translator to find the relationship between words.

Example 11:

ST: Extensive lava flows, once hardened into basalt, tend to be highly permeable because of numerous intersecting fractures formed by shrinkage of the lava during cooling. The permeability of Hawaiian basalt is so great that most **rainwater** soaks directly into the ground. There is little runoff from these young **flows**. Well-defined **streams** do not have time to form, or if they do form, they are buried by new **flows**. On the older islands, however, where volcanism has ceased, many **streams** have eroded deep valleys.

TT1: 大量的熔岩流一旦固化成玄武岩，因其在冷却过程中收缩从而形成的大量交叉裂缝，往往具有高渗透性。夏威夷玄武岩的渗透性很强，大量的**雨水**直接渗透到地下。新涌出的**熔岩流**几乎没有径流。分明的**熔岩流**来不及成型，马上就被新的**熔岩流**淹没。但是，在更古老的岛屿上，火山已经不再喷发，许多**熔岩流**侵蚀了幽深的山谷。

TT2: 岩浆在冷却过程中收缩会产生许多交叉裂缝，因而大量的熔岩流在固化成玄武岩时，夏威夷玄武岩的渗透性很强，大量的**雨水**直接渗透到地下。雨水很少能形成**溪流**，**溪流**来不及成型，就被新的**水流**淹没。但是，在更古老的岛屿上，火山已不再喷发，许多**溪流**侵蚀了幽深的山谷。

Analysis: The difficulty here is how to establish semantic orientation. According to Halliday, in some cases, the meaning of a word cannot be determined by semantic relations alone, but by relying on a specific connection between the lexical items in question: a tendency to appear together. (Halliday, 1994). An important reference for avoiding ambiguity is context. Contextual parameters are to a large extent established by collocative relations. Therefore, the translator can establish its semantic point according to its collocative environment(王东风,1997). As a result of detaching from the context and looking at these sentences in isolation as individual parts, the TT1 are different from the original meaning. The main content of this paragraph is that basalt has powerful water permeability and its specific performance. When translating, the translator preconceived the “flow” and “stream” as the volcanic things: lava and lava flow. The translator ignored “rainwater” in the first sentence. There was a comprehension problem. To eliminate the ambiguity, it is necessary to refer to the

context. According to the first sentence of the paragraph, basalt is highly permeable to water, so it is difficult for rainwater to accumulate in streams or flows. Therefore, the word “flows” does not mean “lava”, but “streams” (formed by rain). Since “flow” means “溪流”, then “stream” means “水流”. Based on the above, we can determine that “flow” means “溪流”. Then we can reproduce the contextual relationship between the isolated words according to the collocative relationship.

Example 12:

ST: In 1868 there was an eruption that was remarkable because it consisted not of lava, but of mud. Known as “the great mud flow,” it accompanied a severe earthquake and has been described as follows:

TT1: 1868 年，有一次喷发非同寻常，因为它喷出的不是岩浆，而是泥浆，被称为“大泥石流”，还伴随着强烈的地震：

TT2: 1868 年，有一次喷发非同寻常，因为它喷出的不是熔岩，而是泥浆。这次喷发被称为“大泥石流”，还伴随着强烈的地震：

Analysis: The key point of this sentence is the reiteration of “it”. Reiteration includes the same word, synonym, superordinate and general word (Halliday, 1974). English uses personal pronouns and demonstrative pronouns more frequently than Chinese, whereas Chinese expresses illocutionary relations through zero-form references and repetition of nouns much more frequently than English. TT1 is a literal translation, with the two sentences combined into one. The subject of the second sentence is omitted. TT2 breaks the sentence according to the original text and translates “it” as “这次喷发”. The subject is advanced and the reference is clear, which is more in line with the Chinese language habit. This will also make the distance between sentences closer, and the reader will understand the logic better.

3.2.4 Reconstruction of Sentence Patterns

There is a huge difference between English and Chinese. When translating, the translator has to reconcile the contradictions between the two. When a sentence is long or structurally complex, the sentence structure can be reconstructed. Word-for-word translations can make sentences look redundant. Therefore, the

translator needs to analyze the structure and centre of the sentence or relate it to the context to achieve coherence of semantic content.

Example 13:

ST: In the Hawaiian Islands, **many of them were formed by the explosive interaction of magma and seawater that seeped through fractures.**

TT1: 在夏威夷群岛, 其中有许多是由岩浆和海水通过裂缝渗入的爆炸性作用形成的。

TT2: 在夏威夷群岛, 有许多火山是由岩浆和渗入裂缝的海水相互作用, 产生爆炸形成的。

Analysis: TT1 expresses the message of the source text correctly, but it is too redundant. many of them and explosive interaction are not explained enough, while TT2 conveys the message directly and clearly. The translator first analyzes the grammatical structure and finds that there is a problem in understanding “magma and seawater that seeped through fractures”. The phrase “seeped through fractures” modifies “seawater”, not “magma and seawater”. Chinese has a habit of stating the condition first and placing the important elements at the end of the sentence. The translator has split the sentence and put the predicate structure at the end of the sentence. This is more in line with the Chinese habit of expression.

Example 14:

ST: The southeastward movement of the fire goddess in search of ever newer homes corresponds wonderfully to the north-westward movement of the Pacific plate over a hot spot that continually creates new volcanic islands.

TT1: 火山女神向东南寻找全新的住所的路线, 与太平洋板块在热点上向西北持续移动, 产生的新的火山岛的路径一样。

TT2: 火山女神为寻找新住所不断向东南方向行进, 与太平洋板块在热点上向西北方向移动, 不断创造新火山岛的行动轨迹, 不谋而合。

Analysis : English prefers long sentences and omits punctuation marks, while Chinese prefers short sentences and more punctuation marks. TT1 cuts according to the sense group, but does not adjust the sentence structure. It does not conform to the Chinese language habit. After analyzing the sentence structure, we find that the main

part of the sentence is “A corresponds to B”. A is “the southeastward movement of the fire goddess” and B is “the north-westward movement of the Pacific plate”. Both A and B have an accompanying adverbial, so the sentence seems complicated. Only by splitting the predicate part into short sentences can the translation appear less complex. After splitting it up, “不谋而合” is used to express “corresponds wonderfully”, giving full play to the linguistic advantage of Chinese.

Example 15:

ST: ①Shield-building volcanism on Kauai, for instance, took place between 5 and 6 million years ago. ②But between 1 and 1.5 million years ago, volcanism returned with the development of swarms of north-northeast-trending dikes and vents.

TT1: ①例如, 考艾岛的盾构火山活动发生在 500 到 600 万年前。②但在 100 到 150 万年前, 火山活动卷土重来, 出现了大批东北偏北走向的岩脉和喷口。

TT2: ①例如, 考艾岛的盾构火山活动发生在 500 到 600 万年前。②但在 400 到 450 万年后, 火山活动卷土重来, 出现了大批东北偏北走向的岩脉和喷口。

Analysis: The key point here is that TT1 translates the adverbial of time “ago” as “在...之前” in two sentences. The reader will be confused about the time and order. Since English attaches importance to rationality and logic, the source text takes the present moment as the time reference. But Chinese pay more attention to the whole and inspiration, sentence ① is the background of sentence ②, and the two sentences are actually in a progressive relationship. So Chinese readers are more inclined to take sentence ① as the time reference. “Ago” and “后” also reflect the differences in thinking patterns between Chinese and English. “在...后” is more suitable with “卷土重来”. Accordingly, “1 and 1.5 million” should be converted to “400 to 450”. It is easier for readers to accept the sentence ②. The translator must sort out the logic of the text to improve the quality of the translation by analyzing relationships between sentences and making adjustment based on context.

3.3 Expressiveness of Literary Quotations.

Yan Fu believes that translation involves three requirements difficult to fulfil:

faithfulness, expressiveness and elegance. Faithfulness is difficult enough to attain but a translation that is faithful but not expressiveness is no translation at all. If the translator fails to achieve “expressiveness”, she will fail to achieve faithfulness and elegance. Therefore, expressiveness is of prime importance. In this section, we will focus on the intertextuality and rhetorical devices to make the source text reach “expressiveness”.

3.3.1 Understanding through Intertextuality

Zhang Meifang (2005) believes that the study of discourse must be linked to its context, and that context and discourse are interdependent. According to De Beaugrand and Dressler, no discourse exists in isolation, it always has some kind of connection with other discourses, and this is intertextuality. From micro perspectives, intertextuality studies the specific intertextual phenomena and specific practical methods in translation. (李文戈, 2018) Yang Yansong (1994) believes that any piece of work has the cultural characteristics of its nation and has a connection with other nations, and it will always have all kinds of direct or indirect textual causalities with the thoughts or words of its predecessors or contemporaries.

Example 16:

ST: A people believing that Pele the Goddess

would wallow in fiery riot and revel

On Kilauea,

Dance in a fountain of flame with her devils,

or shake with her thunders and shatter her island,

Rolling her anger

Through blasted valley and flaring forest

in blood-red cataracts down to the sea!

TT1: 人们相信火山女神佩蕾，

会沉浸在激情的狂欢中，

在基拉韦厄，

在火山喷泉中与她的魔鬼共舞，
震动大地、粉碎岛屿，
她的火气蔓延荒谷和森林
在鲜红的洪流中奔向大海！

TT2: 人们相信火山女神贝利

会勃然大怒，
基拉韦厄会浓烟滚滚！
她会用那火焰之泉与恶魔共舞，
电闪雷鸣，撕碎岛屿！
她那愤怒之火会穿过荒谷，燃烧森林，
倾泻而下，直入大海！

Analysis: The quotation of the source text adopted Kapiolani, a poem by the famous English poet Tennyson. The poem is little known and it is difficult to find information about the source text on websites and in books. Therefore, the translator's initial translation is not fluent. The translator did not realize the role and connotations that the poem played on the discourse. The translator understood the source text during the translation process. Kapiolani is a legendary Hawaiian leader. The Hawaiians have long believed that by making offerings to Pele they would be prevented from being harmed by volcanic eruptions. To break this superstition, she threw eaten ohelo fruits into the volcanic crater, which was considered disrespectful by the locals. She challenged the local belief volcano goddess. The poem can only be properly understood if the intertextuality between the quotation and the content of the text is comprehended. The poem, mythology and the process of volcanism are mutually dependent and interacting. It is only through a correct understanding of the content and the internal relationship of the discourse that translators can achieve Yan Fu's "expressiveness".

3.3.2 Using Rhetoric to Make the Quotations Expressive

A good translator must learn not only to transplant the content of the original work but also to retain its original format, combining content and form. When it is not

possible to do so, the form should be abandoned in favor of the semantic meaning. (王德军,2007) On the premise of faithfully expressing the original thought content, we must exert the advantages of the translated language to compensate for the source language lost in the process of translation (孙迎春,1996). Sometimes the translator must destroy the source text to convey its meaning correctly. This section compensates through four-character words and similes to make the quotations expressive.

Example 17:

ST: A people believing that Pele the Goddess

would wallow in fiery riot and revel

On Kilauea,

Dance in a fountain of flame with her devils,

or **shake with her thunders and shatter her island,**

Rolling her anger

Through blasted valley and flaring forest

in blood-red cataracts down to the sea!

TT1: 人们相信火山女神佩蕾，

会沉浸在激情的狂欢中，

在基拉韦厄，

她在火山喷泉中与魔鬼共舞，

或是用雷霆震动大地、粉碎岛屿，

她的火气遍及荒谷和森林

在鲜红的洪流中奔向大海！

TT2: 人们相信火山女神佩蕾，

会勃然大怒，

基拉韦厄会浓烟滚滚！

她会用那火焰之泉与恶魔共舞，

电闪雷鸣，撕碎岛屿！

她那愤怒之火会穿过荒谷，燃烧森林，

倾泻而下，直入大海！

Analysis: The difficulty here is how to convey the meaning and reflect the beauty of the original poem. Nida (2004) has said, “The metre of the poem, the acrostic character of the poem and the intentional form of alliteration are untranslatability.” To some extent, four-character words can complete stylistic compensation. At the same time, the metaphorical image of the original text is also retained. It makes the text lively and enhances the rhetorical effect. The translator tried her best to restore the metaphorical rhetoric of the source text. For example, to translate “shatter her island” into “撕碎岛屿”, “rolling her anger” into “愤怒之火” and “wallow in fiery riot and revel” into “勃然大怒”, which retained the feature of the source text and increased the expressive power of the text. This approach gives the target language great expressiveness, as well as the beauty of word meanings. In addition to adding lexical beauty, four-character words can develop rhythm in intonation and are rich in phonetic beauty. In the source text, there are “shake with her thunders, shatter her island, rolling her anger”. The rhythm /ə(r)/ and the form “Verb+her +Noun” are obvious, so the translation should try to restore this poetic quality. Four-character words are easy to read and create a sense of beauty in Chinese. It reflects the informative and expressive functions of the source text and achieves expressiveness.

Example 18:

ST: The roof is...thickly studded with little lava-pointed **icicles** an inch long, which hardened as they dripped...if one will stand up straight and walk any distance there, he can get his hair combed free of charge.

TT1: 它的顶部密密麻麻布满 3 厘米左右的小岩浆尖，滴下来时就变硬……如果有人挺直腰板走几步，那他就能免费梳头了。

TT2: 它的顶部密密麻麻布满 3 厘米左右的像冰锥一样的小岩浆尖，滴下来时就变硬……如果谁敢挺直腰板走几步，那他就能免费梳头了。

Analysis: The quotation in this part is from Mark Twain's work *Roughing it*. The passage is typical of Mark Twain's style. He pioneered a style of language that combines humor and satire. In this description of the lava tunnels, there are many

adjectives, short sentences, descriptive and similes with a simple writing style. Mark Twain was good at using similes, so the word “icicle” should be translated here. It is used to compare the shape of the lava tip to the icicle. Through similes, readers can visualize it based on life experience. The last sentence of the paragraph demonstrates Mark Twain’s style of irony, so it should be translated in a more playful style. The treatment of “谁敢” is better than “有人”, which enhances the emotional color of the sentence with a satirical meaning. This example shows Mark Twain’s writing style through the rhetorical devices of simile and irony. Such an approach achieves expressiveness.

Chapter 4 Conclusion

4.1 Proofreading

A competent translator must be willing and adept at repeatedly thinking about the translation. Proofreading is the process of revision and polishing, and only by treating the translation carefully and patiently can we have a qualified translation.

First, the translator carried out self-proofreading, from format to mistranslation. By the requirements of the publisher, names of places and persons appearing for the first time need to be followed by the original text. The translator reviewed and modified the translation several times from the reader's point of view. Then, this translation practice is a team project. The translator and the team members established a glossary together to unify the terminology and uncommon names of places and people. Then, we proofread the translation through the glossary to ensure the consistency and accuracy of the translation. Besides, the supervisor conducted the proofreading and gave valuable suggestions on the difficulties of the translations. The final proofreading was done according to the tutor and group member's suggestions.

4.2 Main Gains

The translator met many difficulties in the translation process and tried to find solutions. The main findings are as follows:

Firstly, analyzing the text type can be very helpful to the translation process. The translator should have a full understanding of the content, context, and purpose of the source text. Understanding the source text can help the translator to make alternative decisions. The original text can be interpreted accurately by analyzing the source language type, structure and logic.

Secondly, when there is a vacuum of sense, the translator can supplement the information in the source text with footnotes and explanations. This is a very direct and effective way when it comes to cultural information. It can make up for the

reader's blind spot. Readers can be familiar with foreign cultures.

Thirdly, sometimes it is difficult for the translator to get rid of the thinking pattern and thus fail to achieve semantic coherence. The translator makes the sentences coherent by logical word additions, extension of meaning, lexical cohesion and reconstructing sentence patterns. These three ways make the translation smoother and conform to the linguistic habits of Chinese readers.

Last but not least, for the quoted novels and poems, the translator chooses to retain the original style. Some four-character words were used in translating the poem. When translating a novel, the translator chooses to reveal its metaphors to match the style of the original author. The style of the source text is highlighted through intertextuality and rhetorical devices to be expressive.

4.3 Limitation

In the process of translating *Volcanoes in Human History: the Far-Reaching Impact of Major Eruptions*, the translator discovered her limitations. There are several reflections as follows:

Firstly, the translator needs to broaden her knowledge. Translators will meet various types of text in their work. If the translator cannot understand the text, then it will be difficult to translate. There are many unfamiliar words of geology when translating *Volcanoes in Human History*. Therefore, translating a text well needs a long accumulation of knowledge. Translators have to expand their reading areas.

Secondly, the ability of information retrieval and software use needs to be improved. The most important thing in the information age is the ability to retrieve information. Useful information is valuable for the translation. CAT software and translation tools can improve efficiency and accuracy. Therefore, translators need to use tools to optimize translation.

Thirdly, translators also need to improve their ability of bilingual conversion. For example, translators are affected by the fixed thinking mode of source text when translating complex sentences. It is difficult to express them in a precise and concise

way. Therefore, one should dare to break the original structure and rephrase it in targeted language habits. Translators need to understand the characteristics of both languages to achieve better bilingual conversion.

Bibliography

- [1] Boer, Jelle Zeilinga De& Sanders, Donald Theodore. Volcanoes in Human History[M]. New Jersey: Princeton University Press, 2005.
- [2] Halliday, M. A. K. An Introduction to Functional Grammar[M]. Beijing: Foreign Language Teaching and Research Press, 2010.
- [3] Halliday, M. A. K& R. Hasan. Cohesion in English[M]. London: Longman, 1976.
- [4] Reiss, K. Translation Criticism: The Potentials and Limitations[M]. Shanghai: Shanghai Foreign Language Education Press, 2014.
- [5] Nida, E. Toward a Science of Translating[M]. Shanghai: Shanghai Foreign Language Education Press, 2004.
- [6] 陈宏微. 汉英翻译基础[M]. 上海: 上海外语教育出版社, 1998.
- [7] 胡壮麟. 语言学教程[M]. 北京: 北京大学出版社, 2009.
- [8] 胡壮麟, 朱永生, 张德禄, 李战子. 系统功能语言学概论[M]. 北京: 北京大学出版社, 2005.
- [9] 柯平. 加注和增益——谈变通和补偿手段[J]. 中国翻译, 1991(01):23-26.
- [10] 李伟. 文学翻译中文化语境的功能及作用[J]. 西安外国语学院报, 2006(03).
- [11] 李文戈. 语篇对比与翻译研究[M]. 北京: 科学出版社, 2016.
- [12] 刘宓庆. 文化翻译论纲[M]. 北京: 中译出版社, 2019.5.
- [13] 刘宓庆. 新编当代翻译理论[M]. 北京: 中译出版社, 2019.5.
- [14] 冉倩. 计算机辅助翻译术语库的应用[J]. 科技资讯, 2021,19(34).
- [15] 孙迎春. 损失、补偿与“雅”字[J]. 中国翻译, 1996(03):11-15.
- [16] 王东风. 连贯与翻译[M]. 上海: 上海外语教育出版社, 2009.
- [17] 王东风. 文化缺省与翻译中的连贯重构[J]. 外国语, 1997(06):56-61.
- [18] 杨士焯. 英汉翻译教程[M]. 北京: 北京大学出版社, 2006.
- [19] 张根寿. 现代地貌学[M]. 北京: 科学出版社, 2010.
- [20] 张美芳. 文本类型、翻译目的及翻译策略[J]. 上海翻译, 2013(04):5-10.
- [21] 郑述谱. 术语翻译及其对策[J]. 外语学刊, 2012(05).

Appendices

Appendix 1 Glossary

Number	ST	TT
1	Aa	块状熔岩
2	Aleution	阿留申海沟
3	Asthenosphere	软流圈
4	base surge	基浪
5	Big Island	大岛
6	Bow wave	弓形波
7	Calcite crystals	方解石晶体
8	Cape Kumukahi	库穆卡希角
9	Chain of volcanic	火山链
10	Crustal faulting	地壳断裂
11	curtains of fiery lava	熔岩帘幕
12	Depression	洼地
13	Dike	岩脉
14	Discrete pulses	离散脉冲
15	Fault	断层
16	Flashed to steam	急骤蒸发
17	Gravitational collapse	引力塌陷
18	Guyots	盖奥特
19	Halemaumau	哈雷茂茂
20	Honolulu	檀香山
21	Hot plume	热羽流
22	Hot spot	热点
23	Hualalai	霍阿拉拉火山
24	Hawaiian Ridge	夏威夷脊
25	Kaena Point	卡埃纳角

26	Kahawali	卡哈瓦利
27	Kamehameha	卡美哈梅哈
28	Kapiolani	卡皮奥拉尼
29	Kauai	考艾岛
30	Kauhako	考哈科
31	Keoua	基乌阿
32	Kilauea	基拉韦厄
33	Kipukas	基普卡
34	Koolau Range	科奥劳岭
35	Lanai	拉奈岛
36	Lithosphere	岩石圈
37	Loihi	罗西
38	Magmatic heat	岩浆热
39	Mantle	地幔
40	Maui	茂宜岛
41	Mauna Kea	莫纳克亚山
42	Mauna Loa	莫纳罗亚山
43	Midway	中途岛
44	Molokai	莫洛凯岛
45	Molten lava	熔岩
46	Namaka o kahi	纳玛卡·奥·卡海
47	Namaka o Kahai	纳马卡·奥·卡海
48	Oahu	瓦胡岛
49	oval-shaped caldera	椭圆形破火山口
50	Pa hoe hoe	绳状熔岩
51	Paoa	帕奥
52	Pele	佩蕾
53	Prevailing winds	盛行风
54	seamounts	海山

55	Sediments	沉积物
56	Seismographs	地震仪
57	Shield volcano	盾状火山
58	Spatter cone	寄生熔岩堆
59	Surface plates	地表板块
60	The Emperor ridge	天皇海岭
61	the Kuril-Kamchatka	千岛-勘察加海沟
62	Vent	喷口
63	Volcanic crater	火山口

Appendix 2 Source Text and Target Text

Source text	Target text
Chapter 2 The Hawaiian Islands and the Legacy of Pele the Fire Goddess	第二章 夏威夷群岛与火山女神佩蕾
<u>A people believing that Pele the Goddess would wallow in fiery riot and revel</u> <u>On Kilauea,</u> <u>Dance in a fountain of flame with her devils,</u> <u>or shake with her thunders and shatter her island,</u> <u>Rolling her anger</u> <u>Through blasted valley and flaring forest</u> <u>in blood-red cataracts down to the sea!</u>	人们相信火山女神佩蕾 会勃然大怒， 基拉韦厄会浓烟滚滚！ 她会用那火焰之泉与恶魔共舞， 电闪雷鸣，撕碎岛屿！ 她那愤怒之火会穿过荒谷，燃烧森林， 倾泻而下，直入大海！
——Alfred, Lord Tennyson, “Kapiolani”	——阿尔弗雷德·丁尼生，“卡皮奥拉尼”
THE PEOPLE OF HAWAII have always lived with the perils of volcanism. The islands’ earliest settlers, like early humans everywhere, attributed natural phenomena to gods. Myths about the gods taught each new generation about their volatile environment. Moreover, the ancient beliefs formed the basis of religious and ethical codes, including many taboos, which helped the Hawaiian people cope with their often dangerous surroundings.	一直以来，夏威夷人都置身于火山影响的危险之中。如同世界各地的人们一样，岛上的早期居民将自然现象归因于神。神话故事也让一代又一代人了解他们生存环境的反复无常。此外，古老的信仰还是宗教和道德规范的基础，包括诸多禁忌，帮助夏威夷人应对频繁的险境。
The awesome results of volcanic eruptions, the Hawaiians believed, were	夏威夷人认为火山爆发的可怕后果正是令人生畏的火神佩蕾的作为。很多与

the work of a fearsome deity named Pele, the goddess of fire. Many myths involving Pele were derived from observations of the profound natural changes brought about by volcanism and earthquakes. Pele, who could appear as either a beautiful maiden, or an ugly old woman, was irritable. When annoyed, she would stamp her foot, and the earth would shake. When enraged, she might hurl fiery boulders (volcanic bombs) at offending mortals, or she would generate streams of molten lava, which would spew from mountaintops or from cracks in the flanks of a mountain and destroy everything in their path. Sometimes the lava would flow down to the sea and create new land. Pele's power was equaled only by that of her sister Namaka o Kahai, the goddess of the sea, who could quench Pele's fires and erode the land created by her cooled and hardened lava.	佩蕾有关的神话都是由火山和地震引发的自然变化得来的。佩蕾脾气暴躁，有时是个曼妙少女形象，有时又被描绘成一个丑陋的老太婆。她生气时跺跺脚，大地就跟着震动；发怒时，会向得罪她的人投掷火焰巨石（火山弹），或者生成熔岩流，从山顶或山两侧的裂缝中涌出，所经之处皆遭覆灭。有时候，岩浆会流入海洋，形成新的陆地。佩蕾的力量只有她的姐姐——海神纳马卡·奥·卡海（Namaka o Kahai）可与之匹敌，她能把佩蕾的火焰熄灭，把岩浆冷却硬化后形成的陆地腐蚀掉。
<u>The people both feared and respected Pele, and they tried to assuage her capricious temper with offerings of food and small animals, along with garlands of</u>	人们敬畏佩蕾，想通过供奉食物、小动物、花环(leis)以及圣果奥赫洛(Ohelo)野莓¹来安抚她反复无常的脾气。他们把礼物放在熔岩流的边上、活火山口附

¹ 奥赫洛野莓果：被夏威夷人视为圣果。当地人会将浆果扔向佩蕾在大岛上的家——基拉韦厄方向。据说奥赫洛是佩蕾的姐姐化身而成。这位女神在临死前让儿子把自己埋在母亲的肚脐上，也就是基拉韦厄山顶。儿子照做后，她就化身成野莓果树，树以她的名字命名。——译者注

flowers, called leis, and sacred ohelo berries. They would place these gifts at the edge of a lava flow or near the fire pit of an active volcano or would sometimes hurl them directly onto the red-hot molten rock. Later, tobacco and even bottles of brandy or gin were added to the votive offerings.	近，或直接投入炽热的熔岩中。后来，香烟、瓶装白兰地和杜松子酒都成了供品。
The ancestors of the Hawaiian people came from the islands of Polynesia sometime during the first millennium C.E., having sailed northward across the vastness of an unknown ocean in large outrigger canoes. In 1782 a chief named Kamehameha became ruler of the island of Hawaii, and in 1795, as King Kamehameha I, he united all the major islands under his rule. The Hawaiian monarchy lasted until 1893, when Queen Liliuokalani was forced to abdicate in a revolution supported by American businessmen. Hawaii was annexed to the United States in 1898 and became a state in 1959.	约在公元 1000 年，夏威夷人的祖先从波利尼西亚群岛迁来，他们乘着独桨船向北航行，穿越广袤的未知海洋。1782 年，酋长卡美哈梅哈（Kamehameha）成为夏威夷岛的统治者，1795 年，他统一了属下的所有主要岛屿，成为卡美哈梅哈一世国王。夏威夷的君主制延续到 1893 年，直到一场美国商人操纵的革命迫使丽留卡拉妮女王（Queen Liliuokalani）退位。1898 年，夏威夷被美国吞并，1959 年正式成为美国的一个州。
The Hawaiian Islands form a northwest-southeast-trending archipelago that extends some 2,400 kilometers across the north-central Pacific Ocean, from tiny Kure Atoll, or Ocean Island, to	夏威夷群岛是一个“西北-东南”走向的群岛，横跨太平洋中北部约 2400 公里，从小库尔环礁（Kure Atoll）又称“大洋岛”，一直到夏威夷岛（又称“大岛”），见图 2-1。这些岛屿实际上是地球上最

the island of Hawaii itself, the “Big Island” (Figure 2-1). The islands are the peaks of the earth’s highest mountains, if we measure from their base on the ocean floor.

高的山峰，要是从海底开始测量的话。

The Himalayas of Asia, of course, are the world’s loftiest mountains. Their highest peak, Mount Everest, has an elevation of 8,848 meters above sea level. The highest of the Hawaiian peaks, the often snow-capped Mauna Kea (Hawaiian for “white mountain”) on the island of Hawaii, is 4,205 meters above sea level—but the ocean floor at its base is about 5,000 meters deep.

当然，亚洲的喜马拉雅山才是世界上最高的山脉。最高峰珠穆朗玛峰海拔 8848 米。夏威夷最高的山峰是常年积雪覆盖的莫纳克亚山（Mauna Kea，夏威夷语意为“白山”），位于夏威夷岛，海拔 4205 米，但其水下还有约 5000 米深。

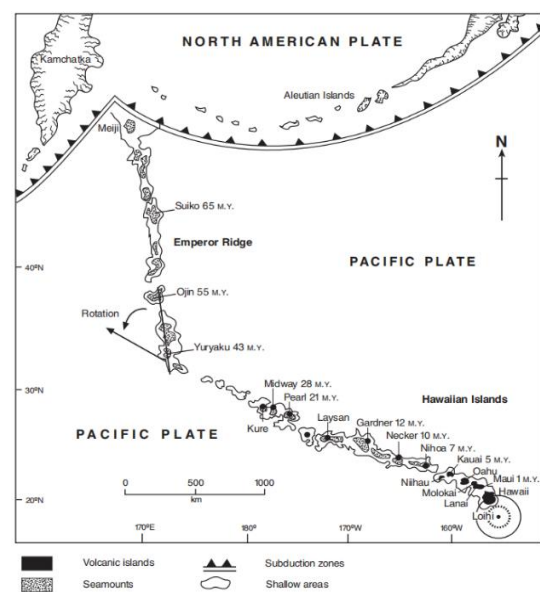


FIGURE 2-1. The Hawaiian Islands and the seamounts of the Emperor Ridge in the northern Pacific Ocean. Approximate ages are given in millions of years

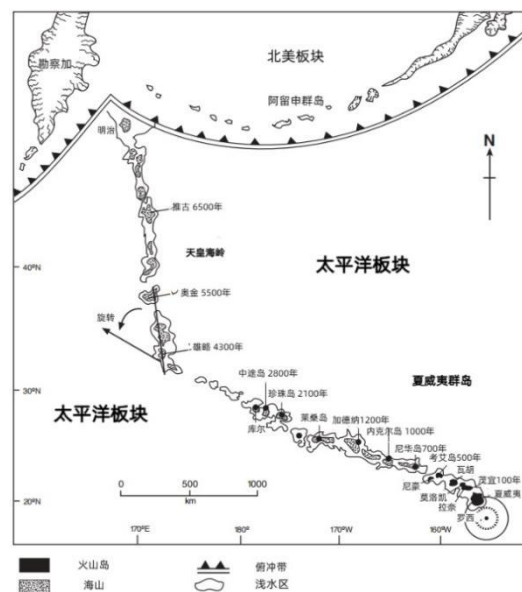


图 2-1，夏威夷群岛和位于北太平洋的天皇海岭。近似年龄以百万年为单位（M.Y.）。这条火山链的方向特征在大约 4000 万年前发生突变，当时太平洋

(M.Y.). The abrupt change in direction of this chain of volcanic features was created about 40 million years ago, when the Pacific plate changed direction as it passed over the Hawaiian hot spot.	板块在经过夏威夷热点时改变了方向。
Thus the true height of Mauna Kea is more than 9,000 meters. Neighboring Mauna Loa (long mountain) is only 35 meters lower than Mauna Kea.	所以莫纳克亚山的真实高度超过 9000 米。它旁边的莫纳罗亚山（“长山”）只比它低 35 米。
The world's largest volcanic mountain in terms of sheer mass, Mauna Loa is an oval-shaped dome about 100 kilometers long and 50 kilometers wide at its base on the ocean floor. At its summit is a huge caldron-shaped depression, or caldera, known as Mokuaweoweo. It is some 6 kilometers long, 2.7 kilometers wide, and, in places, 180 meters deep.	就绝对质量而言，莫纳罗亚山是世界上最大的火山，它有一个椭圆形的基座，长约 100 公里，宽约 50 公里，位于海底。山顶是个巨大的锅状洼地——破火山口，夏威夷语称为“沉船”（Mokuaweoweo）。它长约 6 公里，宽约 2.7 公里，有些地方深 180 米。
The Hawaiian volcanoes have been built up very slowly, mainly by outpourings of lava, which, over millions of years, have covered large areas and created huge, dome-shaped mountains with gently sloping sides. Their shape is said to resemble a warrior's shield lying flat with its convex side up; hence they are known as shield volcanoes and are the prototype for such volcanoes around the world.	夏威夷火山的形成非常缓慢，主要通过数百万年来岩浆的喷涌。岩浆覆盖大片区域，形成巨大的圆丘状山脉，两侧坡度平缓。据说它们的形状就像战士的盾牌，平放在地上，凸面朝上，因此也被称为“盾状火山”。夏威夷火山也是世界上此类火山的原型。
During most eruptions in the Hawaiian	在夏威夷岛的多数喷发中，岩浆从火山

Islands, lava pours from fissures in the flanks of the volcanoes. The eruptions typically last from a few days to several months, and several have gone on for years. Sometimes lava will flow around certain areas and leave them undamaged. <u>These island-like areas, which range in size from a few square meters to many square kilometers, are called <i>kipukas</i>. Many of them preserve plants from which seeds and spores spread to barren lava fields, where they start life anew.</u>	侧翼的裂缝中倾泻而出。喷发通常持续几天到几个月，有些持续几年。有时岩浆会绕着特定的区域流动，但不会对他们造成损害。<u>最终形成的一些岛屿状的区域，面积从几平方米到几平方公里不等，称为“基普卡”（<i>kipukas</i>）。由于许多“基普卡”都覆盖着植被，植物的种子和孢子就会传播到贫瘠的岩浆区，在那里开始新生活。</u>
The lava is relatively fluid, so volcanic gases ordinarily escape into the atmosphere with little of the ash, pumice, and cinders that are associated with eruptions that involve more viscous lava, from which gases escape explosively. Nevertheless, spectacular curtains of fiery lava, as well as volcanic bombs, may initially shoot into the air from several places along a fissure. Then the eruption settles down, and the emission of lava usually is restricted to one or more active vents. The molten rock flows down the mountainside in rivers that sometimes move as rapidly as 40 kilometers an hour.	夏威夷火山喷出的岩浆通常流动性较强，火山气体逃逸到大气中，几乎不会携带火山灰、浮石和煤渣，这些东西都与比较粘稠的岩浆的喷发有关，那种喷发气体逸出时会发生爆炸。不过，仍能在多处看到壮观的炽热熔岩帘幕（<i>curtains of fiery lava</i>）和火山弹，在开始喷发时从裂缝射入空中。然后，喷发归于平静，最终只留下一两个活口继续喷发。熔岩沿着山坡流淌，有时速度可达每小时 40 公里。
The surface and bottom layers of a lava flow cool and harden as the lava moves	当岩浆流下山坡时，岩浆的表面和底层会冷却、变硬。有时会形成固体管道，

down the mountainside. Sometimes solid tubes are formed, through which hot, liquid lava continues to flow. Some of these lava tubes are several meters in diameter. Mark Twain visited Hawaii in 1866 and, in his book <i>Roughing It</i>, described two such tubes:	滚烫的液态岩浆就在这些管道中持续流动。有些熔岩管道直径长达几米。1866 年, 马克·吐温来夏威夷访问, 在他的作品《艰苦岁月》中这样描述两条熔岩管道:
Their floors are level, they are seven feet wide, and their roofs are gently arched. Their height is not uniform, however. We passed through one a hundred feet long. . . . It is a commodious tunnel, except that there are occasional places in it where one must stoop to pass under. <u>The roof is . . .thickly studded with little lava-pointed icicles an inch long, which hardened as they dripped. . . . if one will stand up straight and walk any distance there, he can get his hair combed free of charge.</u>	它们的底部是平的, 有两米多宽, 顶部微微隆起。不过, 高度并不统一。我们穿过一条三十多米长的管道。……这是一条宽敞的隧道, 但有的地方必须弯腰才能过去。<u>它的顶部密密麻麻布满 3 厘米左右的像冰锥一样的小岩浆尖, 滴下来时就变硬……如果谁敢挺直腰板走几步, 那他就能免费梳头了。</u>
<u>Most lava solidifies into either of two forms of basalt known by the Hawaiian terms aa (pronounced "ah-ah") and pahoehoe ("pa-hoy-hoy"), which have been adopted by volcanologists worldwide.</u> Aa has a rough, often jagged surface that is extremely difficult to walk upon, whereas the surface of pahoehoe is typically smooth and undulating, sometimes having a ropy texture. Where pahoehoe flows into the sea, it often	<u>大多数岩浆凝固成玄武岩的两种形态, 一种夏威夷人称作“阿阿”(aa, 即块状熔岩), 另一种叫“帕霍霍”(Pahoehoe, 即绳状熔岩), 该说法已被世界各地的火山学家采用。</u>“阿阿”的表面粗糙, 一般是锯齿状, 很难在上面行走, 但“帕霍霍”的表面光滑起伏, 有的具有绳状纹理。“帕霍霍”流入大海之处, 形成大片的玄武岩, 如同一堆

forms masses of basalt that resemble piles of pillows.	堆的枕头。
<u>Extensive lava flows, once hardened into basalt, tend to be highly permeable because of numerous intersecting fractures formed by shrinkage of the lava during cooling. The permeability of Hawaiian basalt is so great that most rainwater soaks directly into the ground. There is little runoff from these young flows. Well-defined streams do not have time to form, or if they do form, they are buried by new flows. On the older islands, however, where volcanism has ceased, many streams have eroded deep valleys.</u> All the larger islands are blessed with large quantities of fresh groundwater, a priceless resource that is indispensable for Hawaii's agriculture and population.	岩浆在冷却过程中收缩会产生许多交叉裂缝，因而大量的熔岩流在固化成玄武岩时，往往具有高渗透性。夏威夷玄武岩的渗透性很强，大量的雨水直接渗透到地下。雨水很少能形成溪流，溪流来不及成型，就被新的水流淹没。但是，在更古老的岛屿上，火山已不再喷发，许多溪流侵蚀了幽深的山谷。所有比较大的岛屿都享有巨量的新鲜地下水，这种宝贵资源对夏威夷的农业和人口来说必不可少。
Although some areas of the Hawaiian Islands are bleak and barren because of volcanic activity, or arid because high mountains shield them from rainfall brought by prevailing winds, the islands are mostly mantled with lush tropical vegetation. Mark Twain, after his visit in 1866, described the picturesque archipelago as "the loveliest fleet of islands that lies anchored in any ocean."	尽管夏威夷群岛有些地方因火山活动而荒凉贫瘠，或是高山阻碍了盛行风（prevailing wind）带来的降雨而导致干旱，但岛屿大多被茂盛的热带植物所覆盖。马克·吐温在 1866 年的访问之后，把这个风景如画的群岛描绘成“停泊在海洋中的秀美岛屿舰队”。

The tectonic plate that underlies the Pacific Ocean is composed of dense, heavy basalt and is submerged everywhere except where island chains such as the Hawaiian archipelago, or Hawaiian Ridge, have risen above sea level. About 3,200 kilometers northwest of the island of Hawaii, the west-northwest-trending Hawaiian Ridge joins the north-northwest-trending Emperor Ridge, a chain of submerged volcanoes known as seamounts (see Figure 2-1). The abrupt change in direction — a rotation of about 35 degrees—was caused by a change in the motion of the Pacific plate. That change in turn resulted from changes in the orientation of centers of sea-floor spreading, where the Pacific plate is separating from plates that border it to the southeast. As shown in Figure 2-1, the Emperor Ridge can be traced to the juncture of the Kuril-Kamchatka and Aleutian trenches, along which the northwest-moving Pacific plate is being forced beneath the Eurasian and North American plates.	太平洋下面的构造板块由致密、厚重的玄武岩组成，除了夏威夷群岛或夏威夷脊（Hawaiian Ridge）等岛链高于海平面之外，其他地方都被淹没在水下。在夏威夷岛西北约 3200 公里处，西北偏西的夏威夷脊与西北偏北的天皇海岭（Emperor Ridge）相连，这是一条被称为“海山”（seamounts）的水下火山链(见图 2-1)。方向的突然变化——大约 35 度的旋转——是由太平洋板块运动的变化引起的。这种变化反过来又导致海底扩张中心方向的变化，太平洋板块在东南方向与相邻的板块分离。如图 2-1 所示，天皇海岭可以追溯到千岛-堪察加海沟（Kuril-Kamchatka）和阿留申海沟（Aleutian trenches）的交界处，沿此向西北移动的太平洋板块被挤压到欧亚板块和北美板块之下。
The origin of the submerged ridges and island chains in the Pacific Ocean remained an enigma until the 1960s,	太平洋的水下山脊和岛链的起源一直是个谜，直到 20 世纪 60 年代，一场地球科学的革命使人们普遍接受了板块

when a revolution in earth science led to general acceptance of the theory of plate tectonics and recognition of the mobility of the earth's crust. In 1963 a Canadian geophysicist, J. Tuzo Wilson, proposed that the Hawaiian Islands had been formed where the Pacific plate moved slowly west-north- westward over a hot spot — the surface manifestation of a plume of molten rock, or magma, that rose from deep in the earth's mantle. In 1972 W. Jason Morgan of Princeton University extended Wilson's concept to include the Emperor seamounts, which, he proposed, had been formed earlier above the same hot spot, but at a time when the Pacific plate was moving in a more northerly direction.	构造理论，并认识到地壳的可移动性。1963 年，加拿大地球物理学家图佐·威尔逊(J. Tuzo Wilson)提出，夏威夷群岛是在太平洋板块缓慢向西北偏西方向移动过程中形成的，正好移动到一个“热点”之上——热点指的是熔岩从地幔深处汨汨上升。1972 年，普林斯顿大学的杰森·摩根(Jason Morgan)扩展了威尔逊的概念，将天皇海岭也包括在内。他提出，天皇海岭是在同一热点上方形成的，但时间更早，当时太平洋板块正在向更北的方向移动。
Wilson's concept of hot spots ignited a flurry of scientific activity that soon lent support to his idea. Oceanographers determined that the sea floor upon which the Hawaiian Islands have developed is 80 to 120 million years old and that the volcanic rocks exposed on the islands are much younger. The rocks increase in age northwestward, however, with increasing distance from the island of Hawaii and its currently very active volcano Kilauea.	威尔逊的“热点”概念引发了一系列科学活动，这些活动很快为他的观点提供了支持。海洋学家们确定，夏威夷群岛赖以形成的海底有 8 千万到 1.2 亿年的历史，而岛屿上外露的火山岩要年轻得多。不过，从夏威夷岛和岛上目前异常活跃的基拉韦厄火山越往西北，岩石的年龄就越大。茂宜岛 (Maui) 上的哈雷阿卡拉火山 (Haleakala) 上一次喷发还是在 1790 年，现在处于休眠状态。再往西北，莫洛凯岛 (Molo-kai)、瓠胡

Haleakala, on Maui, last erupted about 1790 and is now considered dormant. Farther northwest, on Molo-kai, Oahu, and Kauai, the volcanoes are extinct. On Kauai the volcanic rock is 5 to 6 million years old.	岛（Oahu）和考艾岛（Kauai）上的火山已经灭绝。考艾岛上的火山岩已有五到六百万年的历史。
Starting at least 70 million years ago and continuing to about 40 million years ago, the Pacific plate moved north- northwest at an average rate of about 7 centimeters a year. Since then the plate has moved west-northwest at a slightly higher rate. Over time there has been an increase in the volume of erupted magma, as indicated by the large size of the Big Island compared with other islands in the archipelago.	至少从 7 千万年前开始，一直到大约 4 千万年前，太平洋板块以平均每年约 7 厘米的速度向西北偏北方向移动。此后，板块以稍高的速度向西北偏西方向移动。随着时间的推移，喷发的岩浆量也在增加，从而使得夏威夷大岛要比群岛中的其他岛屿规模都要大。
Volcanism in the islands appears to have occurred in discrete pulses. Periods of volcanic activity have been separated by periods of relative quiescence, and these pulses created a chain of islands as the Pacific plate carried older islands farther and farther to the northwest. The volcanoes on the islands are arranged not in a single row, however, but in two parallel row about 40 kilometers apart, as shown in Figure 2-2. The two rows apparently formed on either side of the	岛上的火山是以不连续的脉冲方式进行的。火山活动时断时续，随着太平洋板块将更老的岛屿向西北方向越带越远，脉冲活动就使得这些岛屿形成一个岛链。如图 2-2 所示，岛上的火山不是排成一排，而是并行的两排，相距约 40 公里。当太平洋板块经过静止的热点时，这两排显然是在其热点两侧形成的，就像河流中巨石两侧形成的一排排涟漪。在 1988 年发表在《纽约客》的一篇文章中，约翰·迈克菲（John McPhee）以优雅的笔触形容岛屿的形成

stationary hot spot as the Pacific plate passed over it, much as rows of ripples form downstream from either side of a boulder in a river. In an article published in <i>The New Yorker</i> in 1988, John McPhee elegantly describes the island-forming process:	过程:
Traveling upward in plumes of, say, two thousand miles, [magmatic heat] eventually encounters the thin surface plates, and may help explain why they move. In any case, when the heat reaches the underside of a plate it punches through, and, as the plate moves, punches through again, and soon again, <u>like the needle of a sewing machine penetrating moving cloth...</u> While the Pacific lithosphere slides overhead, the Hawaiian heat source stays where it is, making islands. There are five thousand miles of... islands, older and older to the northwest, reaching to the trench just east of Kamchatka. <u>Almost all of them have long since had their brief time in the air, and have been returned by erosion and seafloor subsidence into the fathoms from which they arose.</u>	[岩浆热]呈羽状上升,跋涉有两千英里,最终到达薄的地表板块,这也解释了板块为什么会移动。在任何情况下,当热量到达一个板块的底部,它都会穿透;板块移动,它会再次穿透,很快再次.....<u>就像缝纫机的针穿透移动的布料一样。</u>当太平洋岩石圈从顶部滑过时,夏威夷的热源仍留在原地,形成岛屿。岛屿绵延 5000 公里,越往西北越古老,一直延伸到堪察加半岛以东的海沟。<u>几乎所有的岩浆热都曾在空中短暂停留,并最终因侵蚀和海底沉降而返回它们的来处——深海。</u>

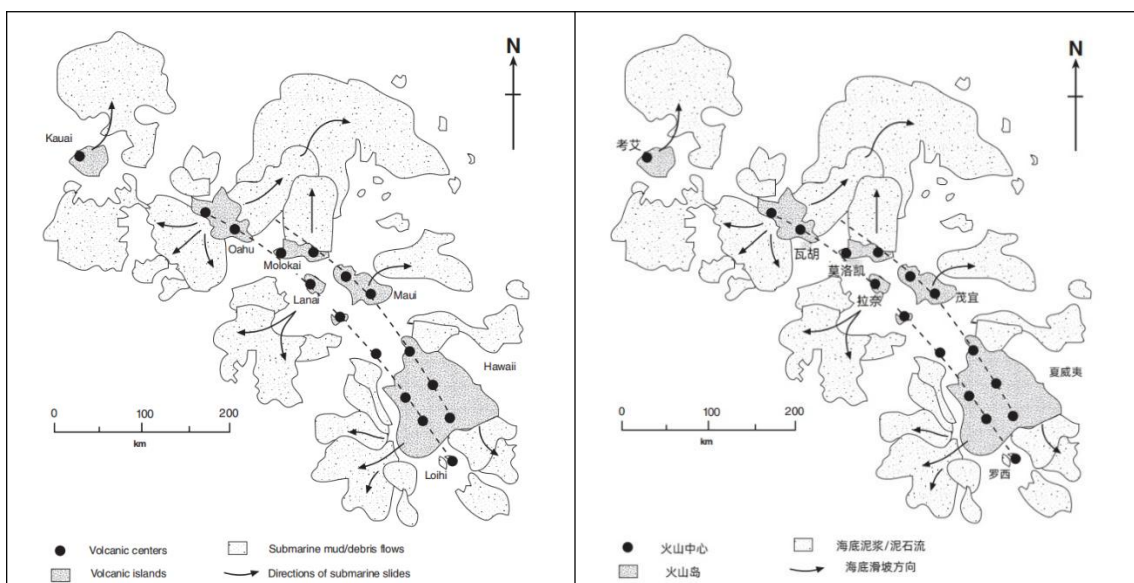


FIGURE 2-2. Distribution of volcanic centers (black dots) on the Hawaiian Islands (dark stippling). The volcanoes are arranged in two rows, as shown by dashed lines. Also shown (light stippling) is the extent of submarine landslides (mud and debris flows) resulting from gravitational collapse of large segments of volcanoes. Adapted from Moore et al., “Giant Hawaiian Underwater Landslides.”

图 2-2 夏威夷群岛（图中深色点状区）上火山中心（图中黑点）分布图。如虚线所示，火山分布成两排。图中还显示了水下滑坡造成泥石流的范围（图中浅色点状区），水下滑坡是由大段火山的引力塌陷所导致。改编自摩尔等人所著《巨大的夏威夷水下滑坡》一书。

The model of a northwest drift of the Pacific plate over a stationary hot spot implies that once an island has left the hot spot, its volcanism should cease. That is not the case, however. Above the hot spot, the weight of volcanic material causes the lithosphere, the solid upper part of the mantle and the overlying crust, to subside, or settle downward. In turn,

太平洋板块在一个固定的热点上向西北漂移，这种模式意味着一旦一个岛屿离开热点，它的火山活动就会停止，但事实并非如此。在热点上方，火山物质的重量导致岩石圈下沉，下沉的岩石圈继而对软流圈施加巨大的压力，在这样的压力下，软流圈就像塑料一样，被横向挤压。当太平洋板块向西北方向移动时，软流层在沉降区前向上凸起，形成

the subsiding lithosphere puts enormous pressure on the asthenosphere, the ductile part of the mantle that underlies the lithosphere. Under such pressure, the asthenosphere behaves like a plastic and is squeezed laterally. As the Pacific plate moves northwestward, then, the asthenosphere bulges upward ahead of the area of subsidence, forming a sort of "bow wave." As a result, the lithosphere ahead of the area of subsidence is uplifted.	一种“弓形波”(bow wave)。因此, 沉降区前方的岩石圈被抬升。
The uplift causes crustal faulting, which creates pathways for renewed intrusions of magma. If the magma solidifies within a fault, it becomes a sheetlike body of rock called a dike. But occasionally the magma reaches the surface and erupts through a vent where, typically, a small cinder cone or spatter cone is formed. <u>Thus on most older islands there is evidence of two phases of volcanism: a primary phase during which the massive shield volcanoes were formed and a minor, secondary phase represented mainly by swarms of dikes and surface vents.</u>	隆起导致地壳断裂, 这为岩浆的再次侵入创造了新路径。如果岩浆在断层内凝固, 它就会变成一个片状的岩体, 称为岩脉。但有时岩浆会到达地表, 并通过喷口喷发出来, 形成小的火山渣锥(cinder cone)或寄生熔岩锥(spatter cone)。因此, 在大多数古老的岛屿上, <u>有证据表明火山活动有两个阶段: 首先形成巨大的盾状火山, 然后形成大量岩脉和表面喷口。</u>
<u>Shield-building volcanism on Kauai, for instance, took place between 5 and 6</u>	<u>例如, 考艾岛的盾构火山活动发生在 500 到 600 万年前。但在 400 到 450 万</u>

<u>million years ago. But between 1 and 1.5 million years ago, volcanism returned with the development of swarms of north-northeast-trending dikes and vents.</u> Shield-building volcanism on Oahu took place between 2.5 and 4 million years ago, but new upwellings of magma created northeast-trending swarms of dikes between 0.3 and 0.8 million years ago. This model implies that renewed volcanism can be expected on western Molokai in the near geological future, about a million years from now.	年后，火山活动卷土重来，出现了大批东北偏北走向的岩脉和喷口。瓦胡岛的盾构火山活动发生在 250 到 400 万年前，但在 30 到 80 万年前，新的岩浆涌出，形成大量东北走向的岩脉。这种模式意味着，在不久的将来，即大约一百万年后，摩洛凯岛西部可能会恢复火山活动。
As a volcano grows older and moves away from the hot spot, it subsides at a rate that becomes faster than its rate of growth. Thus its elevation slowly decreases. Moreover, as soon as a new island rises above the sea, stream erosion, weathering, and wave action begin to wear it down — or, as it might be expressed in terms of Hawaiian mythology, no sooner does Pele create an island than Namaka o Kahai begins to destroy it.	随着火山逐渐老化并远离热点，它的下沉速度会快于生长速度，因而高度慢慢降低。此外，一旦一座新岛屿升出海面，水流侵蚀、风化和波浪作用就开始磨损它——或者，就像夏威夷神话所说，佩蕾只要建造一个岛，纳马卡·奥·卡海就开始摧毁它。
Subsidence of the Hawaiian Islands has created a depression in the sea floor, just as a plank supported at each end bends downward when a heavy weight is placed	夏威夷群岛的沉降造成了海床的凹陷，就像把重物放在一块两端支撑的木板上，木板就会向下弯曲一样。这种凹陷在群岛的两侧都很明显。夏威夷大岛虽

upon it. The depression is evident on both sides of the archipelago. The still-growing Big Island of Hawaii is subsiding at a rate of 3 to 4 millimeters a year. Subsidence on Maui, farther to the northwest, is only about 2 millimeters a year. Oahu, still farther northwest, appears to have attained equilibrium; its load no longer depresses the mantle. In the near geological future, however, Oahu will start to sink again. The lithosphere beneath the island eventually will escape the buoyant effects of Hawaii's hot plume. The lithosphere will cool, become thicker (hence heavier), and slowly subside.	然仍在生长，但下沉速度约为每年 3 至 4 毫米。在更远的西北部，茂宜岛的沉降速度只有每年 2 毫米左右。位于更西北的瓦胡岛似乎已经达到平衡，其负荷不再压迫地幔。不过，在不久的将来，瓦胡岛也会开始下沉，岛下的岩石圈最终将摆脱夏威夷热羽流的浮力作用。岩石圈会冷却，变厚，也因此更重，然后慢慢下沉。
Northwest of Oahu, as the lithosphere moves away from the hot spot, it cools, becomes more dense, and gradually subsides, resulting in a progressive reduction of volcano height. The islands eventually submerge and become seamounts. Toward the northern end of the Emperor Ridge, the combination of subsidence and erosion has created a number of seamounts with flat, wave-eroded tops. Such features are known as <i>guyots</i> in honor of a pioneering Swiss-American geographer and	在瓦胡岛西北部，随着岩石圈远离热点，它开始冷却，密度变大，逐渐下沉，使得火山高度不断降低。这些岛屿最终会被淹没并成为海山。在天皇海岭的北端，在沉降和侵蚀综合作用下，形成了一些顶部平坦、被海浪侵蚀的海山。这些特征被称为“盖奥特”（<i>guyots</i>，平顶海山），以纪念一位地理学和地质学先驱——瑞士裔美国人阿诺德·盖奥特（Arnold Guyot）。

geologist named Arnold Guyot.	
Other old volcanoes, barely above sea level, have been reduced to rocky islets, and fringing reefs of coral have grown up around many of them. Charles Darwin was the first to point out that coral reefs typically continue to grow as a volcano subsides, creating the low, roughly circular groups of islands known as atolls, such as Midway. The Emperor seamounts farther north have sunk too deep, and the water is too cold, to support coral growth.	其他几乎不高于海平面的古老火山已经沦为岩石小岛，周围长满珊瑚礁。查尔斯·达尔文第一个指出，随着火山下沉，珊瑚礁通常会继续生长，形成低矮、大致圆形的岛屿群，称为环礁，例如中途岛。更北的皇帝海山则已经下沉得太深，水温太冷，无法支持珊瑚生长。
The ridge that extends from the Hawaiian Islands to Midway contains eighty-two volcanoes with ages that increase northwestward to 28 million years. The youngest is Loihi, an active seamount about 30 kilometers off the south coast of Hawaii. It rises some 3,500 meters above the ocean floor on the submerged flank of Mauna Loa. Its top is still more than a thousand meters below sea level, however, so it will be a long time (probably hundreds of thousands of years) before it will breach the surface. Then it will form the next island in the chain or, more likely, merge with the island of Hawaii.	从夏威夷群岛延伸到中途岛的山脊包含 82 座火山，其年龄往西北方向递增至 2800 万年。最年轻的是罗西(Loihi)，这是一座距离夏威夷南海岸约 30 公里的活海山。它高出洋底约 3500 米，位于莫纳罗亚火山的水下一侧。但是，它的顶部距离海平面还有一千多米，因此还需要很长时间（可能数十万年）才能突破海平面。然后它将成为岛链中的又一成员，并很有可能与夏威夷岛合并。

Ages for the submerged volcanoes of the Emperor Ridge have been difficult to determine. Volcanic rocks and sediments dredged from several of the seamounts have provided ages that increase north-northwestward from 40 million to 65 million years. Fossils with an age of about 70 million years have been found in sediments covering the Meiji seamount, the most northerly eruption center. Therefore the Hawaiian hot spot appears to have been creating volcanic islands for at least 70 million years. It may well have generated even older islands that have disappeared into the Kuril-Kamchatka Trench and are being melted back into the earth's mantle. If that is the case, many geologists believe the hot spot may have originated about 100 million years ago, roughly when many other hot spots are thought to have been created around the world — a time when the earth must have experienced a tectonic event of truly cataclysmic proportions.	天皇海岭水下火山的年龄一直难以确定。从几个海山挖出的火山岩和沉积物表明火山的年龄约在 4000 到 6500 万年间，沿西北偏北方向递增。在最北端的喷发中心明治海山（Meiji seamount）的沉积物中发现了距今约 7000 万年的化石。因此，夏威夷“热点”创造火山岛的时间至少有 7000 万年了。它很可能还创造过更古老的岛屿，不过已消失在千岛湖——堪察加海沟中，熔融于地幔里。如果真是这样，不少地质学家认为，这个热点可能起源于约 1 亿年前，大致与世界上许多其他热点产生于同一时间——那时地球一定经历了一场真正灾难级的大构造事件。
There are remarkable similarities between the origin of the Hawaiian Islands as explained by plate tectonics and the mythological explanation of how the fire	板块构造说所解释的夏威夷群岛的起源和神话故事所讲述的火神佩蕾如何来到夏威夷岛，竟然十分相似。神话开始讲述了佩蕾的诞生，也具有地质学的

goddess Pele came to live in Hawaii. The myths begin, again with geological verisimilitude, by recounting the birth of Pele. Her mother was Haumea, who personified the earth. Pele emerged from Haumea as molten lava. Her father was Ku-waha-ilo, the “man-eater,” who represented the destructive forces of nature.	真实性。她母亲哈乌美亚（Haumea）是地球的化身。佩蕾从母体降生，化身为熔岩。父亲库瓦哈伊洛（Ku-waha-ilo）是食人者，代表自然的破坏力。
Pele and her sister Namaka o Kahai were born on a mythical island somewhere in the South Pacific. Just as fire and water are incompatible, the sisters were always in conflict. To escape this sibling rivalry, Pele sailed away from their homeland in a great canoe provided by her brother Ka-moho-alii, the shark god. Namaka went off to a high peak on another island, where she could command all the seas.	佩蕾和姐姐——海神纳马卡·奥·卡海（Namaka o Kahai）出生于南太平洋某个神秘小岛。二人水火相容，总是争吵。为了平息这种手足之争，佩蕾乘坐由哥哥鲨鱼神卡莫霍阿力伊（Ka-moho-alii）提供的大独木舟离开家乡，纳玛卡则去了另一个岛的山顶居住，在那里她可以掌管所有的海洋。
Pele had a magic digging tool called Paoa. Wherever she landed, she struck Paoa into the earth and opened a volcanic crater where she could live. At first these small volcanoes were near the seashore, on the flanks of mountains rather than at their tops, and Pele’s sister the sea goddess inevitably sent waves that doused the fires. <u>In the Hawaiian Islands, many of them were formed by the</u>	佩蕾有把神奇的铲子——“帕奥”（Paoa）。无论到哪儿，她都用铲子在地上挖一个火山口，然后住在里面。起初，这些小火山在靠近海岸的山坡上，而不是在山顶。佩蕾的姐姐就卷起海浪把火熄灭。<u>在夏威夷群岛，确有许多火山是由岩浆和渗入裂缝的海水相互作用，产生爆炸形成的。</u>

<u>explosive interaction of magma and seawater that seeped through fractures.</u>	
Eventually Pele made her way to Niihau, the northern most of the main islands in the Hawaiian archipelago. But Namaka o Kahai would not allow her to remain there, so Pele moved eastward to neighboring Kauai, where she dug a deep fire pit. But again Namaka drove Pele from her home.	后来，佩蕾前往尼豪岛（Niihau），夏威夷群岛中最北部的大岛。但是姐姐纳马卡不许她待在那里，佩蕾只好东迁，搬到附近的考艾岛，在那儿挖了一个火山坑，但又被纳马卡赶了出来。
Pele next went to Oahu and dug a fire pit near presentday Honolulu, but her sister drowned the pit in salt water. Moving southeast along the shore, Pele used Paoa to dig a pit at today's Diamond Head. That landmark is now understood to be the eroded remains of an ancient, extinct volcano comprising many layers of compacted volcanic ash and fragments of a limestone reef that was penetrated by the volcano's upwelling magma. Its name comes from the glittering of calcite crystals in pieces of limestone as sunlight plays upon them. But alas! Pele dug too deep and struck water, which quenched her fires. What happened in fact is that groundwater or perhaps seawater penetrated into the magma chamber, flashed to steam, and created an	随后，她又去了瓦胡岛，在现在的檀香山附近挖了一个火山坑，但姐姐又用海水把坑浇灭了。佩蕾沿海岸向东南迁移，用铲子在现在的“钻石头”（Diamond Head）挖了一个火山坑。这个地标现在被认为是一座古老死火山的侵蚀遗迹，包括多层致密的火山灰和岩浆上涌产生的石灰岩礁碎片。“钻石头”是因石灰石碎片中的方解石晶体在阳光下闪耀而得名。可惜，佩蕾挖得太深，碰上了水，熄灭了火焰！事实上，这是因为地下水或海水透入岩浆室，急骤蒸发，产生了爆炸性喷发。

explosive eruption.	
So Pele next went to Molokai, where, on the north shore, she dug the crater known today as Kauhako. Lava emitted from that volcano created the isolated Kalaupapa Peninsula, site of a former leper colony, now a national historical park. But again Pele struck water. Namaka o Kahai forced her to move on, ever southeastward.	所以佩蕾又去了摩洛凯岛（Molokai），在海岛北岸，她挖出了今天被称为考哈科（Kauhako）的火山口。火山喷出的熔岩形成与世隔绝的卡劳帕帕半岛（Kalaupapa Peninsula），这里曾是麻风病人的隔离区，现在是国家历史公园。但佩蕾又碰到水了——纳玛卡迫使她继续向东南方向前进。
Today the site of a national park, the awesome depression was long thought to be a volcanic caldera. There is little doubt that it was originally volcanic (even today it contains lava flows and cinder cones), but in 1985, geologist Harold T. Stearns proposed that, as it exists today, the depression is an erosional feature caused by the joining of two valleys from opposite sides of the mountain. Stearns's view is now generally accepted.	今天，作为一个国家公园的所在地，令人敬畏的洼地长期以来一直被认为是火山口。毫无疑问，它最初是火山（即使在今天，它也包含熔岩流和煤渣锥），但在1985年，地质学家哈罗德·T·斯特恩斯（Harold T. Stearns）提出，就像今天存在的那样，洼地是由山的两侧的两个山谷连接而成的侵蚀特征。斯特恩斯的观点现在被普遍接受。
On the neighboring island of Maui, Pele at last climbed to the top of a mountain and succeeded in digging an enormous crater, today's Haleakala.* Namaka o Kahai saw smoke rising from the mountain and came to do battle with her hated sister. In a furious fight she tore Pele to pieces and scattered her bones	在附近的茂宜岛，佩蕾终于爬到山顶，成功挖出一个大型火山口，就是现在的哈雷阿卡拉。纳玛卡看到山上有烟升起，就赶紧过来跟讨厌的妹妹斗争。在一场激烈的战斗中，她将佩蕾撕成碎片，把她的骨头洒在岸边，现在那里有不规则的熔岩块，就称为“佩蕾的骨头”。纳玛卡以为自己大获全胜，但随

along the shore, where today there are irregular masses of lava called <i>Naiwi o Pele</i> (Pele's bones). <u>Namaka o Kahai reveled in her apparent victory, but later, from her remote aerie, she looked back toward the island of Hawaii and saw clouds of red-hued smoke rising from a flaming crater atop the high mountain we call Mauna Loa.</u> In those clouds she saw the spirit of Pele, and she knew then that she would never vanquish the goddess of fire.	后，她从自己的住处回望夏威夷岛，看到红色的烟雾从我们称为莫纳罗亚的高山顶上兴起。在云雾中，她看到佩蕾的灵魂，她知道，自己永远也无法击败火神了。
It is said that when Pele arrived on Hawaii, she found another fire god, Ailaau, already in residence, but he fled before her greater power. His name, meaning "one who devours forests," alludes to the lava flows that frequently ate their way through the island's woodlands, setting them afire and burying mountainsides and fertile valleys. A few hundred years after such a catastrophe, however, the hardened lava would begin to break down from weathering, and its mineral nutrients would be added to the soil. New forests would grow, and crops would flourish in the valleys. Thus the Hawaiians, like people of many cultures in volcanic	据说佩蕾到达夏威夷时，她发现另一位火神艾劳（Ailaau）已在此定居，但他见佩蕾比自己更强大，便逃走了。“艾劳”意为“吞噬森林者”，暗指熔岩经常侵蚀岛上的林地，引发山火，吞噬山坡和肥沃的山谷。然而，这样的灾难发生几百年后，硬化的熔岩因风化作用开始分解，其矿质营养会被土壤吸收。新的树木开始生长，农作物在山谷地中更加茁壮。因此，和在火山地区生活的其他民族一样，夏威夷人也认识到他们的火神具有两重性。既能带来好处，也能造成破坏。因此，人们对火神既怕又敬，甚至还产生了一些眷恋。

regions, recognized a duality in their fire gods. Their gods could be beneficent as well as destructive. Therefore the gods were both feared and respected, and even regarded with some affection.	
<u>The southeastward movement of the fire goddess in search of ever newer homes corresponds wonderfully to the north-westward movement of the Pacific plate over a hot spot that continually creates new volcanic islands.</u> And the ravages of Pele's sister the sea goddess reflect a folk awareness of the erosional processes by which new islands become old and eventually, inevitably, disappear beneath the sea.	火山女神为寻找新住所不断向东南方向行进，与太平洋板块在热点上向西北方向移动，不断创造新火山岛的行动轨迹，不谋而合。佩蕾的姐姐海神纳玛卡的破坏行为反映出人们对侵蚀过程的认知，新的岛屿会变旧，最终不可避免消失在海洋中。
According to the mythology, Pele dwells today in Halemaumau, a fire pit within the caldera of Kilauea, located on the southeastern flank of Mauna Loa. Though it arises from Mauna Loa, Kilauea is a separate mountain. The two volcanoes have different conduits for upwelling magma, though occasionally magma from one volcano gets into the plumbing system of the other. Kilauea's summit is 1,247 meters above sea level, almost 3,050 meters lower than the top of Mauna Loa. Yet Kilauea is a huge mountain,	根据神话，佩蕾现在栖身于哈雷茂茂，这是莫纳罗亚东南侧基拉韦厄破火山口内的一个火山坑。虽然基拉韦厄源于莫纳罗亚，但它是一座独立的山峰。这两座火山有各自不同的岩浆上升通道，尽管有时岩浆也会从这个管道流到另一个管道里去。基拉韦厄海拔只有 1247 米，比莫纳罗亚的最高处要低近 3050 米。但是基拉韦厄一点都不小，它距洋底约 6100 米，它的椭圆形破火山口长达 5 公里，宽约 3 公里，山口悬崖耸立，有些地方高达 120 多米，断层岩块呈现出阶梯状。

rising some 6,100 meters from the ocean floor. Its oval-shaped caldera, almost 5 kilometers long and more than 3 kilometers wide, is bounded by sheer walls that are more than 120 meters high in places and made up of step like fault blocks.	
The caldera is famous for its fire pit, Halemaumau. At times, halemaumau has contained a lake of molten lava. Forming a circular depression in the southwestern part of the caldera, the fire pit marks the top of Kilauea's conduit. Its dimensions vary, depending on volcanic activity and the occasional collapsing of its walls. In historical times, it has been more than 900 meters wide. Its bottom rises and falls according to the rising and falling of magma levels in the conduit. Sometimes lava boils up and overflows onto the floor of the caldera; at other times, when magma leaks into fissures in the mountainside, the lava lake disappears.	破火山口以其火山坑哈雷茂茂而闻名。有时，哈雷茂茂会出现熔岩湖。在破火山口西南部形成一个圆形凹陷，火山坑就是基拉韦厄火山管道的顶点。由于火山活动和偶尔的管壁坍塌，坑的尺寸会有变化。历史上它曾达到 900 多米的宽度，底部随着管道中熔岩的水平而升降。有时岩浆沸腾，溢出到破火山口底部；有时熔岩泄漏到山坡上的裂缝中，熔岩湖就会消失。
The lake presented an awesome spectacle of boiling, red-hot lava during much of the nineteenth century and well into the twentieth, making Kilauea unique among volcanoes. In 1924, however, a flank eruption — through the side of the	在十九世纪的多数时候乃至二十世纪，该湖呈现的火光漫天、岩浆四射的壮观景象令人惊叹，也使基拉韦厄在众多火山中一枝独秀。但是 1924 年，在山的侧翼发生了喷发，熔岩湖干涸了，并且水进入管道顶部，急骤蒸发引发了剧烈

mountain drained Kilauea's lava lake, allowing water to enter the upper part of the conduit, where it flashed to steam and caused violent explosions. Today the floor of the fire pit is just a gray crust of hardened lava. Halemaumau's fires can be seen only during eruptions, when lava rises through fissures in the caldera floor or sometimes bursts into the air in fiery fountains. <u>During these outbursts, droplets of molten lava may cool into globules of volcanic glass known as Pele's tears. Often, as they are wafted through the air, the droplets trail glassy threads, which break off upon cooling. Clusters of the spun-glass threads are said to be Pele's hair.</u>	爆炸。现如今，火山坑底部只是岩浆硬化后形成的灰色地壳。哈雷茂茂的火焰只有在喷发时才能看到，或是岩浆通过破火山口底部的裂缝上升，或是突然猛烈地喷到空中。<u>在这些喷发过程中，熔岩滴可能会冷却成透明液滴，这是“佩蕾的眼泪”（即火山泪）。而当它们在空中吹送时，液滴会拖着透明的细丝，遇冷时断裂。那一簇簇的玻璃纤维是“佩蕾的头发”（即火山毛）。</u>
Mark Twain visited the caldera of Kilauea after dark one evening in 1866 and in his <i>Letters from Hawaii</i> wrote the following account:	1866 年的一个傍晚，天黑之后，马克·吐温参观了基拉韦厄破火山口，他在《夏威夷来信》（<i>Letters from Hawaii</i>）中写道：
The greater part of the vast floor of the desert under us was as black as ink, and apparently smooth and level; but over a mile square of it was ringed and streaked and striped with a thousand branching streams of liquid and gorgeously brilliant fire!...Imagine it — imagine a coal-black sky shivered into a tangled network of	我们脚下的大片沙漠如墨般漆黑，也很光滑平坦；但在方圆一英里的地面上却流淌着千条细流，窜动着绚丽的火焰……漆黑的天空颤抖着，变成一团愤怒之火！

angry fire!	
Here and there were gleaming holes twenty feet in diameter, broken in the dark crust, and in them the melted lava the color a dazzling white just tinged with yellow — was boiling and surging furiously...Occasionally the molten lava flowing under the superincumbent crust broke through like a sudden flash of lightning, and then acre after acre of the cold lava parted into fragments, turned up edgewise like cakes of ice when a great river breaks up, plunged downward and were swallowed in the crimson caldron.	黑漆漆的地壳上布满闪闪发光的洞，直径约有 50 厘米，岩浆喷薄而出，亮白带点黄，沸腾着，奔涌着。 有时，从地下喷出的岩浆就像一道闪电，然后，成片成片的岩浆冷却后四分五裂，像大河决堤时的冰块，翻转过来，俯冲下去，落入暗红色的破火山口中。
<u>Twain had something to say, too, about the sound and even the smell of lava:“the noise made by the bubbling lava is not great... It makes...a rushing, a hissing, and a coughing or puffing sound...The smell of sulfur is strong, but not unpleasant to a sinner.”</u>	<u>马克·吐温还提到岩浆的声音甚至味道：“冒泡的岩浆发出的声音并不大，那是一种急促、嘶嘶、咳嗽或喷嚏般的声音。硫磺的味道很浓，但对罪人来说并不难闻。”²</u>
Kilauea, the youngest of the Hawaiian volcanoes to have emerged above sea level, is among the most active volcanoes in the world. Its eruptions have been frequent, with periods of repose typically lasting from a few days to several decades. Many eruptions are preceded by	基拉韦厄火山是夏威夷海拔最年轻的火山，也是世界上最活跃的火山之一。它的喷发频繁，休息时间通常持续几天到几十年。许多喷发之前，随着岩浆渗透到火山侧翼的裂缝中，部分山体膨胀。就好像火山吸气一样。膨胀改变了山侧的坡度或倾斜度。除了倾斜仪外，

² 在《创世记》和《启示录》中，硫磺是上帝的惩罚手段，代表上帝对罪恶之人的惩罚和警告，上帝用硫磺毁灭了两座城市。

inflation, or swelling, of part of the mountain as magma penetrates into fractures in the volcano's flanks. It is as if the volcano inhales. The swelling changes the slope, or tilt, of the mountain's flanks. Such tilting is imperceptible except to tiltmeters, sensitive instruments that measure minute changes in the vertical position of one point with respect to another. Upward passage of the magma is usually accompanied by small earthquakes. Tiltmeters that detect a mountain's inflation, and seismographs that detect pre-eruption earthquakes, are important tools in efforts to predict volcanic eruptions.	这种倾斜是难以察觉的，倾斜仪是测量一个点相对于另一个点垂直位置的微小变化的灵敏仪器。岩浆向上通过通常伴随着小地震。检测山体膨胀的倾斜仪和检测火山爆发前地震的地震仪是预判火山喷发的重要工具。
Although most eruptions of Kilauea are lava flows that ooze from fissures, explosive eruptions are not unknown. In 1916 Thomas Jaggar, director of the Hawaiian Volcano Observatory on Kilauea, described an eighteenth-century eruption that now is estimated to have had a volcanic explosivity index, or VEI, of 4—explosive enough to be destructive and dangerous.	虽然基拉韦厄火山的多数喷发都是熔岩流从裂缝中渗出，但是爆炸性喷发也并不少见。1916年，位于基拉韦厄的夏威夷火山观测站负责人托马斯·贾格尔（Thomas Jaggar）描述了十八世纪的一次火山喷发，指数能达到4级，足以造成破坏和威胁。
Wrote Jaggar, “even Kilauea is not guiltless of terrific and destructive	贾格尔写道：“即使基拉韦厄也免不了可怕的破坏性喷发。大约在1790年，

explosive eruption. About 1790, thousands of tons of gravel and boulders and dust were strewn over Hawaii from Kilauea, covering hundreds of square miles, destroying the vegetation, and killing some of the people.’’ At the time of the 1790 eruption, the island of Hawaii was ruled by Kamehameha, the chief who, five years later, became king of all the Hawaii Islands. Kamehameha’s right to rule the island was being challenged by another chief, named Keoua. From the town of Hilo, on the east coast, Keoua set out to cross the island with a small army and attack Kamehameha’s forces near the opposite shore. Their path took them past Kilauea, and possibly as a precaution against the volcanic activity, Keoua divided his army into three groups.	数千吨来自基拉韦厄的沙砾、石块、灰尘散落在夏威夷，覆盖了数百平方公里，破坏了植被，还造成人员伤亡。”1790年火山喷发时，夏威夷岛正由酋长卡美哈梅哈统治，五年后，他成为整个夏威夷群岛的国王。卡美哈梅哈的统治权遭到另一位酋长基乌阿（Keoua）的挑战。基乌阿从东海岸的希洛镇出发，带着一小支部队穿越岛屿，从对岸攻击卡美哈梅哈的部队。他们的路线经过基拉韦厄，可能是为预防火山活动，基乌阿将部队分成三组。
The volcano erupted violently just after the first group, led by Keoua himself, had passed the caldera. The ground shook, and Kilauea ejected a dense cloud of gas, ash, and cinders. The hot debris killed some members of Keoua’s party and injured others. The third group, the rear guard, though closest to the caldera, was not in the cloud’s path, so members of that group escaped injury. Rushing	基乌阿亲自率领的第一组人马刚过破火山口，火山就猛烈爆发了。地面晃动，基拉韦厄喷射出浓密的气体、灰烬和煤渣。滚烫的碎屑造成不少伤亡。第三组是后卫部队，虽然离火山口最近，但因不在喷发云的路线上，从而逃过一劫。他们冲上前去，遇到第二组，发现全部丧生，尽管身体几乎没有受伤的迹象。可能是笼罩在地面的火山气体和蒸汽使他们窒息而死。这种现象称为“基浪”

forward, they came upon the second group and found them all dead, though there were few signs of physical injury. Probably they had been asphyxiated by a cloud of volcanic gas and steam that hugged the ground. Such phenomena, called <i>base surges</i>, often accompany eruptions caused by the penetration of groundwater into a volcano's conduit. The water reacts violently with magma and explodes into steam.	(base surge), 通常伴随着地下水渗入火山管道引起的喷发。水与岩浆发生剧烈反应, 最后爆炸形成蒸汽。
Kilauea continued to be active during most of the period from the early 1800s until the flank eruption of 1924, mentioned earlier. <u>In 1868 there was an eruption that was remarkable because it consisted not of lava, but of mud. Known as "the great mud flow," it accompanied a severe earthquake and has been described as follows:</u>	从 1800 年代初到上文提及的 1924 年的侧翼喷发, 基拉韦厄在大部分时间里都保持活跃。<u>1868 年, 有一次喷发非同寻常, 因为它喷出的不是熔岩, 而是泥浆。这次喷发被称为“大泥石流”, 还伴随着强烈的地震:</u>
In the midst of the great earthquake we saw burst out of the top of [a precipice] an immense river of red earth, which rushed down in headlong course and across the plain below, ... swallowing up everything in its way — trees, houses, cattle, horses, men, in an instant as it were. It went three miles in not more than three minutes' time.	在大地震中, 我们看见从[悬崖]顶上涌出一条巨大的红土河,它急泻而下, 穿过下面的平原,把路上的树木、房屋、牛、马、人一下子全吞没了。在三分钟内, 它奔流了三英里。

Most of Kilauea's nineteenth- and twentieth-century activity, however, has involved lava flows from large fissures and from Halemaumau, the lava lake. In 1983 an eruption began from a fissure on the volcano's southeast flank. Known as the Pu'u O'o eruption, from the name of the vent where it began, it continues as this is being written eighteen years later. In 1986 its locus moved 3 kilometers eastward along the fissure zone. Lava production was virtually continuous from that site until 1992, when the locus shifted back to Pu'u O'o. Lava from the eruption has destroyed several communities on Kilauea's southeast flank.	然而，基拉韦厄 19 世纪和 20 世纪的多数活动还是与熔岩有关，熔岩从大裂缝或是熔岩湖——哈雷茂茂喷出。1983 年，基拉韦厄东南侧的一个裂缝开始喷发，称为“普乌欧欧喷发”（Pu'u O'o eruption），取自火山口的名字，18 年后写这本书时，它仍在喷发。1986 年，它的位置沿着裂缝区向东移动了 3 公里。熔岩在这里继续喷发，直到 1992 年喷发地又回到普乌欧欧。基拉韦厄东南侧的几个社区被喷出的熔岩所摧毁。
Cape Kumukahi, the eastern extremity of the Big Island, has been created by repeated lava flows from Kilauea. In Hawaiian mythology, a story about the origin of the cape again illustrates the many correlations between geology and ancient beliefs about the fire goddess Pele. Cape Kumukahi is named after a mythical Hawaiian chief who committed the fatal error of refusing Pele when, appearing as an old woman, she asked to take part in some royal games. When the	位于夏威夷大岛最东端的库穆卡希角（Cape Kumukahi），就是由基拉韦厄反复喷发的熔岩流形成的。在夏威夷神话中，海角起源的传说再次证明了地质学与古代火山女神信仰之间的关联。库穆卡希角是神话中一位夏威夷酋长的名字，他犯下了致命错误：火山女神佩蕾打扮成老年妇女，要求参加王室比赛，库穆卡希傲慢地拒绝了她。随后，一股火泉从地上喷出。库穆卡希赶紧向大海跑去，但复仇的佩蕾用熔岩流将他困在沙滩上，熔岩继续流入大海，就形

chief haughtily refused her request, a fountain of fire burst from the ground. Kumukahi ran toward the sea, but the vengeful Pele trapped him on the beach in a lava flow, which continued on into the sea and created the cape.	成了海角。
Another chief, Papalauahi, and several friends, suffered Pele's wrath when they beat her at the sport of holua riding. A holua is a kind of sled on which Hawaiian youths race down specially prepared grass-covered slopes. Pele saw to it that the racers were caught in a lava flow and turned into pillars of rock—in reality tree molds, which sometimes are created when a stream of lava flows through a forest and solidifies around large trees. The trees burn out, leaving the lava in the form of a hollow cylinder.	另一位酋长帕帕劳阿希（Papalauahi）和几个朋友，因为在“霍鲁亚”滑行（holua riding）比赛中打败了佩蕾，也饱尝了她的怒火。“霍鲁亚”是一种滑橇，夏威夷年轻人乘坐滑橇沿着专门的草坡下滑，一决高下。佩蕾将参赛者困在熔岩流里，后变成石柱——地质学上实际上是“树模”。熔岩流穿过森林，在大树周围凝固时就会产生“树模”——树木燃烧殆尽，熔岩呈空心圆柱体状。
<i>Holua</i> riding figures in another myth, this one involving a chief named Kahawali, an expert <i>holua</i> racer. Again Pele appeared as an unprepossessing woman and asked to use Kahawali's sled. Curtly refusing, he sped off downslope. The angered Pele stamped on the ground, and an earthquake caused the hill to split open. Lava gushed forth and flowed down the race course, with the fiery	在另一个神话中也提到“霍鲁亚”滑行运动，有个叫卡哈瓦利（Kahawali）的酋长，是霍鲁亚运动的行家。佩蕾再次以一个丑女的形象出现，要借卡哈瓦利的滑橇。他草草地拒绝了，飞快地滑下坡去。气急败坏的佩蕾在地上跺了一脚，地震就使山丘开裂。熔岩涌出，在赛道上流淌，愤怒的火山女神则骑着她自己的滑橇在熔岩上驰骋。卡哈瓦利跑到海边，跳上独木舟，疯狂地划着船离

goddess racing atop the molten rock on her own sled. Kahawali ran to the sea, leaped into a canoe, and furiously paddled away from shore. Pele's advance was stopped by the water, so she hurled rocks (volcanic bombs) after Kahawali, although, so the story goes, she failed to kill him. This myth provides not only a lesson in civility but also a graphic description of a flank eruption near the seashore.	开岸边。佩蕾被水挡住去路，于是她向卡哈瓦利扔石头（火山弹），但据说没能杀死他。这个神话不仅是关于礼仪规范，而且生动描述了海边附近的侧翼爆发。
The conduit through which magma rises into Kilauea has been traced by means of seismic data to a depth of about 35 kilometers. Down to that depth, the conduit appears to have a central core surrounded by numerous radiating fissures. Magma rises through both the core and the fissures during highly active periods, but through the core alone during periods of little activity.	通过地震数据可以追踪到，沿基拉韦厄管道上升的岩浆大约处于 35 公里的深度。向下到达这一深度，可以发现管道似乎有个内核，周围环绕着许多辐射裂缝。火山高度活跃时，岩浆会通过内核和裂缝同时上升，活跃度不高时仅通过内核上升。
Magma does not originate at a depth of only 35 kilometers. Melting begins much deeper in the mantle. Geochemical models suggest that the major melting region of the Hawaiian hot spot is about 80 kilometers deep. The volcanic rocks at the surface, however, carry traces of certain isotopes of helium that we know	岩浆起源处并非只有 35 公里深，在地幔更深处就开始熔融了。地球化学模型表明，夏威夷热点的主要熔融区约在 80 公里深处。然而，地表的火山岩携带着某些氦同位素的痕迹，而己知这些同位素是起源于 300 公里以上的深度。因此，热点的形成一定是始于地球深处。

must have originated at depths greater than 300 kilometers. Therefore the process that ultimately leads to the formation of hot spots must begin deep inside the earth.	
The present Hawaiian hot spot has a diameter of about 80 kilometers. The lighter molten material appears to be drawn to several conduits in the middle of that zone and may accumulate in large volumes below the volcanoes. As new batches of magma enter the conduits, upward pressure increases, and magma that arrived earlier surges toward the surface. There, in the crater or caldera of the volcano, lava may accumulate in large lakes, which often drain along fissures radiating from the volcano's summit. In contrast to calderas formed by explosive volcanoes such as Indonesia's Krakatau and Italy's Vesuvius, which are on the margins of converging tectonic plates, most Hawaiian calderas developed when the crater walls collapsed as the magma drained away.	现在的夏威夷热点直径约为 80 公里。较轻的熔融物质可能被吸引到热点中央的几个管道中，并在火山下方大量积聚。随着新一批岩浆进入管道，向上的压力增加，先到的岩浆就会涌向地面。在火山口或破火山口中，熔岩可能积聚成湖，然后沿着山顶的裂缝排出。夏威夷的火山口通常是随着岩浆四散流尽，岩壁倒塌形成的。这与印尼的喀拉喀托火山和意大利的维苏威火山有所不同，这些地方的火山口都是由爆炸性火山形成，因其位于板块汇聚之处。
Despite the shield-like shape of Hawaiian volcanoes, with their gently sloping flanks, many of the islands are bordered by steep scarps, some of them hundreds	尽管夏威夷火山多呈盾状，山坡平缓，但许多岛屿周围都是悬崖峭壁，其中一些高达数百米。有些悬崖就耸立在岛上（最著名的是考艾岛和摩洛凯岛），有

of meters high. Some form spectacular cliffs on the islands themselves (most notably on Kauai and Molokai), and some are hidden beneath the sea around individual islands (Hawaii) or groups of islands (Oahu, Molokai, Lanai, and Maui). Known as <i>pali</i> in Hawaiian, these scarps represent eroded faults along which large slices of the volcanoes have slipped catastrophically toward the deep ocean floor — a process known as gravitational collapse.	些则藏匿在独岛(夏威夷)或岛屿群(瓦胡岛, 摩洛凯岛, 拉奈岛和茂宜岛)周围的水下。这些陡坡在夏威夷语中称为“帕里”(pali), 他们是被侵蚀的断层, 沿着这些断层, 大片火山灾难性地滑向海底深处——这一过程被称为“重力坍塌”。
The massive blocks that were detached along such faults caused submarine landslides (see Figure 2-2). For example about 105,000 years ago, as determined by the age of overlying sediments, a large crustal mass was detached from an underwater scarp southwest of Lanai. The slide, about 40 kilometers wide at the top, became dislodged and traveled as far as 70 kilometers southwestward along the volcano's flank, where it came to rest on the ocean floor at a depth of about 4,500 meters.	巨大石块沿着断层脱落, 造成海底滑坡(见图 2-2)。例如, 大约 10.5 万年前, 根据上覆沉积物的年龄测算, 一个巨大的地壳岩块从拉奈岛(Lanai)西南侧水下悬崖断开。脱落物顶宽约 40 公里, 沿着火山一侧向西南方向滑动 70 公里, 最终停在深约 4500 米的海底。
That submarine landslide created a series of giant waves, or tsunamis, that must have reached the south coast of Lanai in about five minutes. The first wave	那次海底滑坡产生一系列巨浪, 或称海啸, 它们在五分钟内就会到达拉奈岛南岸。第一波浪头撞上了岸, 涨幅高达海拔 190 米。大块的珊瑚礁和大片海底玄

crashed ashore and rose as high as 190 meters above sea level, as indicated by chunks of coral reefs and large pieces of ocean-floor basalt that broke off and were carried far inland. A second wave arrived one or two minutes later and reached an elevation of 375 meters on the island, carrying with it much debris from the first wave. A third wave was again about 190 meters high and subsequent waves became gradually lower. As the waves retreated from Lanai's south coast, they stripped away all vegetation and soil up to the highest elevation they reached, leaving a rocky desert. Waves striking the north coast of the island stripped the ground to an elevation of about 100 meters, which shows that tsunamis can wrap around an island and do considerable damage on the side facing away from their source.	武岩断裂后被卷上内陆就说明了这一点。第二次巨浪在一两分钟后抵达，在岛上冲到 375 米的高度，裹挟着第一波巨浪的众多残骸。第三次巨浪再次达到 190 米的高度，随后，浪高逐步变低。随着海浪从拉奈岛南岸撤退，它们卷走了所有能带走的植被和土壤，只留下一片岩石荒漠。冲击该岛北岸的海浪将土壤剥离到大约 100 米的高度，这表明海啸可以绕过岛屿，在背对其源头的一侧造成相当大的破坏。
The events described above illustrate an often-overlooked aspect of volcanism — the fact that volcanoes, even when no longer active, can be dangerous. Many old volcanoes literally fall apart. The resulting landslides and the related tsunamis can have devastating consequences for residents of coastal	上述事件说明了火山活动经常被忽视的一面——即使不再活跃，火山也可能是危险的。许多老火山实际上已解体，由此产生的山体滑坡和海啸可能对沿海地区的居民造成毁灭性后果。

areas.	
Along the northeastern coast of Oahu, the seaward flank of the massif known today as the Koolau Range sheared off in a sudden cataclysmic landslide that strewn large blocks of volcanic rock several hundred kilometers offshore and left spectacular cliffs 500 to 700 meters high. Some individual blocks in that slide were the size of New York's Manhattan Island.	沿着瓦胡岛东北岸如今被称为科奥劳岭（Koolau Range）的地区，它朝向海的一侧山丘，因为一次突如其来的灾难性滑坡被截断，大块的火山岩散落在离岸数百公里处，留下 500 到 700 米高的峭壁。这场滑坡中，有的石块足有纽约曼哈顿岛那么大。
Similar slides have occurred off the Big Island along the western flank of Mauna Loa, where individual lobes have traveled as far as 100 kilometers beneath the sea, to depths of 4,800 meters. Estimates of debris thicknesses range from 50 to 200 meters, suggesting volumes of 200 to 600 cubic kilometers.	类似的滑坡也发生在莫纳罗亚西侧的大岛附近，那里的单个裂片已在水下行进 100 公里，到达 4800 米的深处。碎片厚度约在 50 至 200 米之间，体积在 200 至 600 立方千米左右。
The cumulative volume of the landslide terrain west of Hawaii is probably 1,500 to 2,000 cubic kilometers. To the east, the entire southern flank of Kilauea is slowly creeping southward along a major fault zone at a rate of several centimeters a year. Short periods of acceleration have caused earthquakes. In 1975 the mass lurched seaward by as much as 7 meters. The lower, submarine section of the slide displaced seawater, producing a tsunami	夏威夷以西的滑坡地形累积达到 1500 至 2000 立方千米。向东，基拉韦厄的整个南翼正以每年几厘米的速度，沿着一个主要断层带缓慢向南爬行。有时短期加速会引发地震。1975 年，此处向海面倾斜了 7 米之多。滑坡的低处及水下部分使海水移位，引发的海啸致两人死亡。

that claimed two lives.	
Earthquakes not only can result from landslides, they can also cause them. During the past century, there have been twenty-five earthquakes strong enough to dislodge large slabs of rock from the flanks of Hawaii's volcanoes. In April 1868 a quake in the southern part of the island of Hawaii triggered a landslide that buried a village and caused a tsunami.	不仅滑坡会导致地震，地震也会造成滑坡。在过去的一个世纪里，发生了 25 次地震，其强度足以将夏威夷火山侧翼的大块岩石移走。1868 年 4 月，夏威夷岛南部的一场地震引发了山体滑坡，掩埋了一个村庄并引发了海啸。
The terrible power of slide-generated tsunamis is illustrated by a myth concerning a huge rock in the ocean off Kaena Point, the northwestern tip of Oahu. The rock is called Pohaku o Kauai, the Rock of Kauai, because it resembles the basalt of that island, which is about 120 kilometers from Kaena Point. A giant demigod named Hau pu, famed as a powerful warrior, lived on Kauai and was awakened one night by the shouts of men. He looked out over the sea and saw lights dancing on the waves, far away toward Oahu. The men were fishermen who had encircled a school of fish and were excitedly hauling in their nets by the light of torches.	滑坡引发的海啸有多可怕，可以通过一个神话故事来说明。传说瓦胡岛西北端卡埃纳角(Kaena Point)附近海域有一块巨大的岩石，叫做“考艾岛之石”，因为它与考艾岛上的玄武岩很像。考艾岛距离卡埃纳角约有 120 公里，岛上住着一位名叫“豪普”的半神巨人，是个大力士。一天晚上，他被人们的呼喊声吵醒。他朝海面望去，看到远处靠近瓦胡岛，有灯光在海浪上跳跃。这些人其实是一群渔民，他们围住了鱼群，兴奋地借着火炬的光亮收网。
Assuming that the men were warriors from Oahu coming to attack him, Hau pu	但豪普却以为这些人是从瓦胡岛来攻击他的勇士，就从地上掀起一块巨石向

tore an enormous boulder from the ground and hurled it into the circle of lights. It caused great wreckage and loss of life and raised huge waves, which swept ashore on Oahu and created a long point of land. The peninsula was named Kaena Point after the chief who was said to have led the fishing party.	光亮之处砸去。巨石造成严重的破坏和人员伤亡，掀起的巨浪席卷了瓦胡岛，并在那里形成一块长条形的陆地——卡埃纳角。“卡埃纳”就是率领渔船的酋长的名字。
In terms of Hawaiian mythology, we might say that between the fire goddess Pele and her sister Namaka o Kahai, the goddess of the sea, Namaka is the more destructive. Her tsunamis, sometimes crashing ashore without warning, have in the past caused terrible damage to the coastal regions of Pele's realm. There is no reason to doubt that they will be any less destructive in the future.	按照夏威夷神话，可以说火山女神佩蕾和她的姐姐海神纳玛卡，纳玛卡更具破坏性。她的海啸会毫无预兆地侵袭海岸，对属于佩蕾地盘的沿海地带造成巨大破坏。毫无疑问，这种破坏性在未来也不会减弱。
Because the Hawaiian Islands are located in the central Pacific, tsunamis generated there travel outward in all directions. Thus, at times they devastate not only the islands themselves but also coastlines all around the Pacific Ocean.	由于夏威夷群岛坐落于太平洋中央，海啸会往四面八方蔓延。因此，有时它们破坏的不仅是岛屿本身，还有太平洋附近的海岸线。
Just as tsunamis originating in Hawaii can travel throughout the Pacific, the islands are often visited by tsunamis that originate far away, triggered by slippage along major faults in the zones of crustal	与此同时，就像源于夏威夷的海啸可以穿过整个太平洋一样，来自远方的海啸也经常造访夏威夷。环太平洋地区的地壳汇聚带常常会因断层滑动而引发海啸。海底断裂变形，通常会引发强震，

convergence that surround much of the Pacific Ocean. Deformation of the sea floor by faulting, usually of the type that generates high-magnitude earthquakes, sets up wave trains that inevitably reach the islands and frequently cause great damage.	形成巨浪席卷岛屿，造成严重破坏。
A tsunami warning system now alerts coastal dwellers when a large wave is approaching the Hawaiian Islands from elsewhere in the Pacific. People can be evacuated from its path, and preparations can be made to minimize wave damage. When a tsunami is generated in the islands themselves, however, there is no time for evacuation, and damage can be much more severe.	当巨浪从别处逼近夏威夷群岛时，海啸预警系统会向沿海居民发出警报。人们可以选择路径疏散，做好准备工作，尽量减少海啸的破坏。但是，当海啸起源于本岛时，就没有时间撤退，损失不可估量。
Unlike tsunamis, very few volcanic eruptions occur today without advance warning. Thus at various times, in various parts of the world, it has been possible to employ human technology in efforts to control lava flows once an eruption has begun. On the island of Hawaii, an attempt at lava control was made during an eruption of Kilauea in 1960. A lava flow threatened the village of Kapoho, on the mountain's eastern flank. Bulldozers pushed up an earthen barrier some 6	与海啸不同，现在火山喷发基本都能提前预警。因此，在不同时代不同地域，一旦火山喷发，就有可能通过科技手段来试图控制熔岩流。在夏威夷岛，1960年基拉韦厄火山爆发时曾试图控制熔岩。一支熔岩流威胁到山脉东侧的卡波霍村庄。人们用推土机堆起6米高、5公里长的土墙。不过最终熔岩还是溢过土墙，摧毁了村庄。

meters high and 5 kilometers long, but lava eventually overflowed it and destroyed the village.	
During an eruption of Mauna Loa that began on November 21, 1935, great quantities of molten lava collected in the saddle between that mountain and Mauna Kea and then broke loose. A fiery river more than 1,240 meters wide moved slowly down the valley toward Hilo, threatening to overrun the city. Thomas Jaggar, director of the Hawaiian Volcano Observatory at the time, decided to try halting it with explosives. He contacted the U.S. Army Air Corps base on Oahu, and on December 27 two squadrons of bombers attacked the advancing flow. Some thirty-three hours later the lava stopped moving, but it soon started again. Finally, on January 2, the flow trickled to a halt about 20 kilometers from Hilo. Scientists later questioned the effectiveness of the bombing, arguing that the lava flow had stopped because the eruption had ended.	1935 年 11 月 21 日,莫纳罗亚火山喷发,大量的熔岩积聚在莫纳罗亚和莫纳克亚两山之间的鞍部,然后破口而出。这条来势汹汹、超过 1240 米宽的河流沿着山谷缓慢地向希洛行进,即将吞没这座城市。彼时,托马斯·贾格尔是夏威夷火山观测站负责人,他决定用爆炸来阻止它。他联系了驻扎在瓦胡岛的美国陆军航空兵团。12 月 27 日,两个轰炸机中队袭击了仍在前进的涌流。大约 33 小时后,岩浆停止进发,但很快它又开始了。最后,在 1 月 2 日,熔岩流在离希洛 20 公里的地方停止。不过,后来科学家们对爆破的作用提出质疑,认为熔流止步也可能是因为喷发已经结束。
Mauna Loa erupted again in April 1942, during World War II, and again sent a lava flow toward Hilo. Again the Air Corps was called in to bomb the lava	1942 年 4 月在二战期间,莫纳罗亚火山再次喷发,并再次朝着希洛进发。航空兵团又被召来爆破熔岩流。爆破队成功炸开熔岩流旁边的坚硬地壳,岩浆从开

flow. The bombers succeeded in breaking up the hard crust at the edge of the flow, and lava flowed through the openings. <u>The lava merely flowed along beside the old stream, however, and rejoined it a short distance downhill.</u> The flow did stop before reaching Hilo, but again the results of the bombing were considered inconclusive.	口流出。<u>但是，熔岩只是在老路旁边流动，并在下坡不远处又汇聚到一起。</u>在到达希洛之前，熔岩流确实止住了，但是否与爆破有关仍无定论。
Hilo was threatened by yet another eruption of Mauna Loa in 1984, but that time the state government ruled that no attempt would be made to divert the lava flow. On the basis of previous experience, officials felt that the effort would be futile. Moreover, the legal consequences of diverting a lava flow onto otherwise undamaged property were considered much too formidable. Fortunately the flow stopped short of the city.	1984 年，希洛再次受到莫纳罗亚喷发的考验，但这次州政府裁定不再试图转移熔岩流。根据以往经验，官员们认为努力也是徒劳。此外，把熔岩流转移到其他未受损害的财产上，法律上也难办。幸运的是，熔岩流在到达城市前止步了。
The difficulties involved in using technology to control lava flows encourage many Hawaiians to appeal to Pele, as they have done for generations. Traditionally failure to treat Pele with great deference has been considered unlucky. Two hundred years ago that belief was dramatically illustrated by	用科技手段也难以控制熔岩流，这使得夏威夷人又转向佩蕾求助，就像他们祖祖辈辈所做的那样。传统意义上，不尊重佩蕾是不吉利的。两百年前，夏威夷岛上霍阿拉拉火山（Hualalai）最后一次喷发使人们更加笃信这一信念。1801 年，岩浆从火山底部喷出，摧毁了不少村庄和种植园，填满了岛屿西侧的一个

events related to the last eruption of Hualalai, on the island of Hawaii. In 1801 lava issuing from the base of the volcano destroyed a number of villages and plantations and filled in a bay on the west side of the island. The lava also threatened some private fish ponds belonging to King Kamehameha. The king tossed offerings of breadfruit and fishes onto the glowing lava, but Pele was not impressed by those meager offerings from so exalted a personage. The lava flowed on. Then the king brought a pig and cast it in; the flow continued. Finally Kamehameha cut off some of his own hair and threw it on the lava, symbolically offering part of himself. Pele accepted that act of obeisance, and the eruption ceased.	海湾。熔岩流也威胁到国王卡美哈梅哈的私人鱼塘。国王把面包果和鱼作为祭品，扔到发光的熔岩上，但佩蕾显然对这位大人物献上这么微薄的祭品不满，熔岩继续流淌。然后，国王弄来一头猪，把它扔了进去，熔岩还是流；最后，卡美哈梅哈剪下自己的一些头发扔了进去，象征性地献出自己的一部分。佩蕾接受了这一膜拜行为，喷发止住了。
That Pele was not all-powerful, however, was demonstrated twenty-three years later by Kapiolani, wife of a chief on the island of Hawaii. American missionaries had converted Kapiolani to Christianity, and she was determined to show that Pele was not to be feared, that the fire goddess was merely a superstition. In December 1824, despite dire warnings from priests of Pele, Kapiolani and a determined	但是，23年后，夏威夷岛一位酋长的妻子卡皮奥拉尼（Kapiolani）证明了佩蕾并非无所不能。美国传教士说服卡皮奥拉尼改信基督教，她决心向世人证明，佩蕾并不可怕，火山女神不过是一种迷信。1824年12月，不顾佩蕾祭司的严重警告，卡皮奥拉尼和一群坚定的支持者还是从夏威夷西部的家中出发，不顾艰辛前往基拉韦厄。守旧的人们试图劝阻她，坚信如果她靠近哈雷茂茂——佩

group of supporters made the arduous journey to Kilauea from her home in western Hawaii. Members of the old faith tried to dissuade her, fully believing she would die a horrible death if she approached Halemaumau, the fire pit where Pele dwelt. "I should not die by <i>your</i> god," replied Kapiolani. "That fire was kindled by <i>my</i> god [italics added]."	蕾居住的火山坑，就会死无葬身之地。“我不会死在你的神手里”，卡皮奥拉尼答道，“那火是我的上帝点燃的”。
With her friends, she climbed to the caldera and descended to the very rim of Halemaumau. There she defied Pele by breaking a religious taboo. She picked some sacred ohelo berries, but instead of eating some and sharing the rest with the fire goddess by throwing them into the fire pit, as custom demanded, she ate them all. She further insulted Pele by hurling stones into the pit. Then she led her faithful companions in prayer, and they sang a Christian hymn. Afterward, to the amazement of onlookers, the group climbed out of the caldera unharmed.	她和朋友们一起爬上破火山口，来到哈雷茂茂身边。在这里，她通过打破宗教禁忌来蔑视佩蕾。先是摘了一些奥赫洛野莓圣果，把它们全部吃掉，而按照习俗，她本应自己吃一点，把剩下的扔进火山坑与火神分享。接着，她把石头扔进火山坑，进一步侮辱佩蕾。然后，她带领忠实的伙伴们开始祈祷，唱基督教赞美诗。最后，在围观者的惊讶声中，这群人毫发无损地爬出了火山口。
In 1892 the British poet Alfred, Lord Tennyson, immortalized that courageous act in a poem he titled simply "Kapiolani":	1892 年，英国诗人阿尔弗雷德·丁尼生把这件事写成诗歌“卡皮奥拉尼”，赞扬她的勇敢：
When from the terrors of Nature a people have fashioned and worship a	当人们从对自然的恐惧中 塑造出邪恶之神并顶礼膜拜，

Spirit of Evil, Blest be the Voice of the Teacher who calls to them “Set yourselves free!” ...Great and greater, and greatest of women, island heroine, Kapiolani Clomb the mountain, and flung the berries, and dared the Goddess, and freed the people Of Hawa-i-ee! A people believing that Pele the Goddess would wallow in fiery riot and revel On Kilauea, Dance in a fountain of flame with her devils, or shake with her thunders and shatter her island, Rolling her anger Thro’ blasted valley and flaring forest in blood-red cataracts down to the sea! ...Kapiolani ascended her mountain, Baffled her priesthood, Broke the Taboo, Dipt to the crater, Called on the Power adored by the	一个智者的声音冲他们喊道： “解放自己吧！” 那最最伟大的女性——卡皮奥拉 尼 她是夏威夷的英雄， 攀上了那座山，扔下了那浆果， 挑战了火山女神， 解放了夏威夷人民！ 人们相信火山女神佩蕾 会勃然大怒， 基拉韦厄会浓烟滚滚！ 她会用那火焰之泉与恶魔共舞， 电闪雷鸣，撕碎岛屿！ 她那愤怒之火会穿过荒谷，燃烧森林， 倾泻而下，直入大海！ ...卡皮奥拉尼攀上了山峰， 让祭司们束手无策， 她打破了禁忌， 走到火山口， 呼唤那基督徒所敬仰的力量， 大喊着： “我敢挑战她，让卡皮奥拉尼来复仇吧！” 她把浆果投进滚滚烈焰， 把恶魔赶出夏威夷！
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Christian, and crying, “I dare her, let Peele avenge herself”! Into the flame-billow dash’d the berries, and drove the demon from Hawa-i-ee.	
Though Kapiolani flung stones, not “the berries” as Tennyson wrote, his poem captures the boldness of Kapiolani’s exploit in 1824. The old beliefs persisted, however. In 1881 an eruption of Mauna Loa threatened Hilo. Princess Ruth Keelikolani, a granddaughter of King Kamehameha I, approached the edge of the advancing lava front and, chanting ancient incantations, ritualistically offered Pele silk scarves, a variety of food dishes, and brandy. The lava flow did not stop immediately, but by the next day it had come to a halt short of the city. That act of Princess Ruth did much to keep the ancient beliefs alive.	虽然卡皮奥拉尼扔的是石头，而不是丁尼生写的“浆果”，但他的诗却体现了卡皮奥拉尼在 1824 年这一事件中的勇敢。但是，古老的信仰并未消亡。1881 年，莫纳罗亚火山喷发威胁着希洛。卡美哈梅哈一世国王的孙女露丝·基利科拉尼公主（Ruth Keelikolani）来到正在奔流的熔岩旁边，念着古老的咒语，献上佩蕾丝巾、各种食物以及白兰地。熔岩流没有立即停止，但第二天，它在城市附近停下了脚步。露丝公主的这一行为在很大程度上使古老的信仰得以延续。
And still today the Hawaiian people attempt to assuage the wrath of Pele by placing offerings for the fire goddess near lava flows, or even upon them. Food, bottles of brandy, items of clothing, and other gifts are often left near the rim of the caldera on Kilauea, where the spirit of Pele continues to dwell in the fire-pit	直到现在，夏威夷人仍然试图通过在熔岩流旁边或上面献祭，来平息火神佩蕾的愤怒。食物、白兰地酒瓶、衣服或其他礼物经常被放在基拉韦厄破火山口的边缘，人们相信佩蕾的灵魂依旧住在这被称为“哈雷茂茂”的火山坑内。

called Halemaumau.	
The myths of Pele and her malevolent sister Namaka o Kahai live on, just as volcanic eruptions, tsunamis, and their aftereffects will continue to threaten the inhabitants of what Mark Twain called “the loveliest fleet of islands that lies anchored in any ocean.”	佩蕾和她狠毒的姐姐纳玛卡的神话还在继续，正如火山喷发、海啸以及它们带来的后果，将会一直威胁着马克·吐温所说的“停泊在海洋中的可爱的岛屿舰队”上的居民。

注：文中划线部分为报告正文中所选取的译例。