When Science Speaks Arabic: Borrowing and Rankshift in the Arabic Translation of the Demon-Haunted World

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Abstract

With the global development of science over the years, the need for adequate translation between culturally and structurally diverse languages, such as Arabic and English, has become a key issue in the world of science to achieve effective scientific communication. This paper employed a descriptive qualitative methodology to analyse ten samples selected from both the target and original versions of Sagan's book *The Demon-Haunted World: Science as a Candle in the Dark* (English and Arabic). Each one was evaluated to determine the impact of the strategy adopted, and to investigate its influence in retaining the original meaning, making reader comprehension easier, and to ensure that the target text is culturally appropriate. The results show that borrowing is the most frequently used strategy, especially in the translation of coined terms which do not have Arabic equivalents, whereas syntactic shifts are used to restructure complex sentences into more familiar Arabic expressions. The results suggest that the translator adopted a flexible and mixed approach that handles the scientific context sensitively, with a focus on clarity. The study concludes by emphasizing the importance of using more than one translation technique to overcome linguistic barriers. It recommends more attention to combining strategies where needed to preserve both scientific accuracy and rhetorical decision making in translator training programs.

Keywords: Borrowing, Rankshift, Scientific Translation, Carl Sagan, Arabic Scientific Terminology, Translation Strategies.

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عندما يتحدث الخطاب العلمي بالعربية: الترجمة بالاقتراض و تحويل التراكيب في النسخة العربية لكتاب "عالم تسكنه الشياطين"

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المستخلص

يتناول هذا البحث استخدام استراتيجيتي الاقتراض والتحويل التركيبي كوسيلتين لترجمة كتاب العالم الأمريكي كارل ساغان الشهير "عالم تسكنه الشياطين: العلم شعلة في الظلام" إلى اللغة العربية. ومع ازدياد العولمة العلمية، تزداد أهمية الترجمة الدقيقة والمراعية للثقافة، لا سيما بين لغتين متباينتين مثل الإنجليزية والعربية،من خلال تحليل وصفي نوعي لمجموعة مختارة من المقاطع المترجمة، تمت دراسة كيفية تطبيق استراتيجيتي الاقتراض والتحويل التركيبي، ومدى تأثيرهما في الحفاظ على الدقة العلمية، وتحقيق سهولة الفهم لدى القارئ العربي. أظهرت النتائج أن الاقتراض تم توظيفه غالبًا مع المصطلحات الحديثة أو المصطلحات التي تفتقر إلى مكافئ عربي دقيق، بينما ساعد التحويل التركيبي في تكييف الهياكل النحوية المعقدة لتصبح أكثر سلاسة وقابلية للفهم باللغة العربية.

تؤكد الدراسة على أهمية المرونة في اعتماد الاستراتيجيات، مع دمج أكثر من أسلوب عند الحاجة، بهدف تحقيق التوازن بين الدقة العلمية وسهولة الوصول اللغوي. وتوصي بأهمية تدريب المترجمين العلميين على التمييز بين الحالات التي تتطلب اقتراضاً أو تحويلاً تركيبياً بناءً على السياق

كلمات مفتاحية: **الاقتراض، التحويل التركيبي، الترجمة العلمية، كارل ساغان، المصطلحات العلمية العربية،استر اتيجيات الترجمة.**

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1.Introduction

Every day, many scientific research, innovations, and various discoveries become very important in our lives, usually in ways we took for granted. Starting with mobile phones, cars and computers to complex machines in huge factories and many different devices we use at home or outside, science plays a crucial and indispensable, role in our lives. For this reason, misunderstanding a scientific term or mistranslating a concept may lead to serious consequences, especially in Arabic-speaking communities where the majority of scientific development is received via translation.

Scientific language, English in particular, is known for very distinct properties: a specialized lexicon or terminology, a formal and simple style, heavy use of abbreviations, and etymological roots drawn from Latin and Greek to a large extent. These properties pose significant challenges and obstacles for translators transferring scientific texts from English into Arabic. Scientific texts are often intended to communicate complex concepts and technical facts precisely; on that account, translating them is not a simple matter of finding word equivalents but rather a problematic and demanding task that requires the accurate transfer of specialized knowledge across cultural and linguistic boundaries.

Due to these challenges, and to bridge the linguistic and cultural gaps in the process of scientific translation in an effective way, more attention towards functional strategies that can be depended on has increased. The most used strategies in relation to the field of translation studies, often in scientific translation, are borrowing and rankshift. The first indicates the use of the original item directly, with or without literal translation (transliteration). Otherwise, rankshift is meant to change the grammatical structure such as changing a phrase into a clause or a single word into a phrase, or vice versa. Both strategies can be considered as supportive tools which give translators flexibility to preserve the original

meaning as well as the tone in order to make the text more accessible for readers in general.

In this paper, we try to find out how the translator invested the strategies of rankshift and borrowing in the Arabic copy of Carl Sagan's scientific book *The Demon-Haunted World: Science as a Candle in the Dark*. In this scientific book, different challenges can be obviously distinguished. The most prominent challenges lay in the continuous efforts to balance between scientific adequacy and accessibility for general readers. This makes the book a good case to investigate and analyse how translators face difficulties, and how they handle them, in particular linguistic and cultural ones, when they translate scientific texts into Arabic.

2. Literature Review

Scientific text is a hard field to translate as it always demands firm, clear, and precise work. It is a functional text, which often includes terms with no Arabic equivalents taking into consideration the language and the social habits of the target readers.

Borrowing is one of the translation strategies where the term is directly used in the second language, without any changes or being translated, as Vinay and Darbelnet pointed out (1995:85). It is a beneficial strategy in scientific translation. It is especially used when there are no Arabic equivalents or new terms that have not gained broad acceptance so far. Al-Masri also pointed out that borrowing is often a main choice because it keeps the technical meaning clear and consistent with international norms (2010:9).

It must be taken into consideration that borrowing can be seriously problematic, as it prevents general readers from accessing scientific texts (Kharma, 1987). It is seen as a sociolinguistic problem, faced by the translator of scientific texts, implying the choice between remaining loyal to the original language terms and the norms of the target language culture (Mansour, 2005) .

Rankshift was presented as a notion or concept involved with changing grammatical ranks, such as rendering a clause as a phrase in the process of translation (Halliday, 2004). This translation strategy is necessary when dealing with two syntactically and culturally different

languages such as English and Arabic. It is noticeable that rankshift is helpful in preserving meaning when the translator is adopting the grammatical structure rules of the target language (Baker,1992 ; Hatim & Mason,1997).

Scholars such as (Shunnaq, 1999; Al-Qahtani,2015) noted that the use of rankshift strategies in the translation of scientific texts to deal with the problem of complex syntactic structures , translating long English scientific units into shorter and divided ones in Arabic supports accessibility and comprehension، for example.

As asserted by Hassan (2011), translating scientific texts demands syntactic compression and adequate terminology management, especially between two very diverse languages such as English and Arabic.
In other words, rankshift is a fundamental choice to adapt long English sentences into more accessible and readable Arabic ones without damaging the original meaning of the source text (Shunnaq, 1997).

Context-based strategies have been supported in the translation of scientific and technical discourse; mentioning that rankshift and other structural shifts allow more semantic flexibility (Baker, 2018). Later on, (Al-Azab, 2019) found that Arabization strategy interacts with borrowing, in the translation of scientific neologisms, in specific, giving more preference for hybrid terms in modern translations.

Salama-carr (2006) also participated in this issue; she presented extensive data analysis on the impact of terminological adequacy on the reception and comprehension of translated scientific texts.

The first difficulty the translator faces is that the new terminologies which do not have Arabic equivalents yet in addition to carrying ambiguous meanings or cultural concerns. For example, Facebook and Black Start should not be literally translated but should be rendered into Arabic strategically and with a creative method.

Based on these views, this research investigates the use of borrowing and rankshift in one of the popular Arabic-translated books, which may contribute to a better understanding of the strategies chosen in the translation process.

3. Methodology

By adopting an analytical descriptive methodology, this study investigates ten samples to analyze the use of borrowing and rankshift strategies in the Arabic translation of The Demon-Haunted World by Carl Sagan. Furthermore, it is based on Vinay and Darbelnet's (1995) comparative model of translation as a theoretical framework to identify and classify these two aforementioned techiques.

According to Newmark (1988), functional scientific translation should involve a regular and mutual interaction between literal and communicative translation to ensure target language readability. Consequently, the translator's decisions are influenced by the type of text as well as the communicative purposes, which support the Skopos theory adopted in this methodology (House, 2015).

Hatim and Mason (1997) urged that translation strategies must be context-sensitive with strong dedication to semantic and pragmatic accuracy especially in scientific discourse.

Nord (2005) noted that Skopos-based strategies offer flexibility when translating specialized texts, such as scientific literature, where precision and function are paramount.

This study aims to examine how rankshift and borrowing are used, as translation strategies, to transfer scientific texts effectively. It also seeks to identify how these strategies, especially rankshift, affect meaning, clarity, structure, or terminology.

Data will be analyzed according to Vinay and Darbelnet's model (1995) for borrowing while Halliday's Systemic Functional Grammar (2004) will be used to examine the rankshift strategy.

4. Data Analysis

The table below summarizes selected examples from the book analyzed for Borrowing and Rankshift strategies.

English Phrase	Arabic Translation	Strategy Used	Comments / Analysis

The Demon-Haunted World	عالم تسكنه الشاطين	Rankshift + Modulation+ cultutal adaptation	Shift from noun phrase to relative clause. 'Haunted' metaphor translated as 'inhabited', adapting meaning culturally. Cultural adaptation is seen in selecting a term that fits Arabic cultural perceptions of supernatural
Science as a Candle in the Dark	الفكر العلمي في مواجهة الدجل والخرافة	Modulation and cultural adaptation	Modulation and cultural adaptation worked together to render the abstract phrase more accessible and meaningful in Arabic.
Science is more than a body of knowledge	العلم اكثر من مجرد منظومة من المعرفة	Modulation + Rankshift	The metaphor "body of knowledge" was modulated to "منظومة من المعرفة" to convey the same idea in more natural Arabic. Rankshift occurred at the phrase level to restructure the expression.
It's a way of thinking	إنه طريقة للتفكير	Literal + Structural Adaptation(Rankshift)	Literal translation with a structural shift by transformation into an Arabic nominal sentence with tawkid (emphasis) using "إنّ"
Placebos are	والادوية الوهمية	Borrowing +	*Placebos* was directly

dummy drugs, often sugar pills.	placebos عبارةعن ادوية لاتفيد ولا تضر, وغالبا ماتكون اقراصا من السكر.	Explanation + Modulation	borrowed into the sentence. The expression *dummy drugs* was modulated and explicated as " ادوية لاتفيد ولا تضر", providing clearer meaning to Arabic readers.
UFO sightings	رؤية الاطباق الطائرة	Borrowing+ Rankshift	The acronym “UFO” was translated as a culturally adapted borrowed term " الأطباق الطائرة", reflecting prior established usage in Arabic media. A structural shift occurred by turning the noun phrase into a verbal expression, enhancing clarity for Arabic readers.
Mars is much more clement than Venus	اما المريخ فهو اكثر رحمة من الزهرة	Rankshift + Borrowing+ Modulation	Proper nouns "Mars" and "Venus" are borrowed. The adjective "clement" is modulated to "رحمة" to suit Arabic semantics. The structure was rankshifted by adding emphasis with "أما" and reformulating into an Arabic nominal sentence for stylistic fluency

We've arranged things so that almost no one understands science and technology.	كذلك نظمنا الامور بحيث لا يصبح بمقدور كل شخص تقريبا فهم العلم والتكنلوجيا	Rankshift + Modulation	The verb phrase "arranged" became a nominal sentence in Arabic — a rankshift. The phrase "almost no one understands" was modulated into an expression of inability, making the idea more culturally appropriate and indirect.
There would be no room for pseudoscience	فلن تجد الدجلنة مكانها	Borrowing + Rankshift	"Pseudoscience" was creatively rendered as "الدجلنة," derived from Arabic roots. The shift from conditional (would be) to assertive "لن" also shows modulation.
So he imagined space filled with a mysterious substance he called the aether	لذا تخيل حيزًا مليئًا بمادة غامضة أسماها الأثير aether (or ether)	Borrowing + Transliterat-ion + Annotation + Modulation	The translator borrowed the term "aether" directly and supported it with its English forms in parentheses, demonstrating both transliteration and annotation. Modulation is also applied in "he called" → "أسماها", adapting the structure for natural Arabic flow.

5. Results and Discussion

Borrowing was employed strategically, especially for terms that are either universally known in their English forms or difficult to translate without losing specificity. For instance, the term “aether” in “he called the aether” was presented as "الأثير" in the Arabic version, with the original term retained in brackets. This indicates partial borrowing, where the translator kept the scientific term recognizable while adapting it phonetically and semantically. Such a method ensures conceptual accuracy, especially in scientific discourse where equivalent terms are lacking or imprecise. Also, as seen in the example of "pseudoscience" translated as "الدجلنة", the borrowing was partial and conceptual. The translator avoided phonological imitation and opted for a culturally rooted instead, Arabic-sounding neologism to maintain clarity and avoid reader confusion.

These examples indicate that borrowing in scientific texts can vary: some terms are conceptually borrowed, while others retain partial phonological resemblance.

Furthermore, rankshift was also used regularly to restructure long or complex English sentences into more readable Arabic ones. We may refer to the rendering of "The Demon-Haunted World" as " عالم تسكنه الشياطين". The shift from the adjective “haunted” to a relative clause “تسكنه” reflects the syntactic norms of Arabic, where embedded clauses often replace dense nominal phrases. This adjustment made the meaning clearer and the structure more in line with Arabic readability.

These alterations are fundamentally important because the Arabic language prefers clarity, fluency, and concise structures.

Both strategies were used together, which suggests that the translator did not rely on a specific strategy in a stable manner but instead made contextual decisions based on term familiarity, sentence length, and target reader comprehension. This can be clearly seen in the rendering of “The Demon-Haunted World” as “عالم تسكنه الشياطين”, where “haunted” is rankshifted into a relative clause “تسكنه. At the same time, the translator retained the conceptual reference to “demon” using “الشياطين”, which functions as a cultural borrowing rather than a literal equivalent. This

dual strategy helped preserve both the original tone and clarity in Arabic.

Generally, the translator was able to convey the basic scientific ideas, but he had to alter some sentence structures to be more familiar to Arabic readers. Meanwhile, he borrowed cultural terms in order to avoid causing some confusion if they were translated. In the sentence “Mars is much more clement than Venus” , for example, the structure was shifted from a simple comparative sentence into a nominal sentence in Arabic: "أما المريخ فهو أكثر رحمة من الزهرة". This is a clear use of rankshift, where the original adjective-based clause was restructured by foregrounding the subject and inserting أما and فهو to suit Arabic syntactic norms. Additionally, “clement” was translated through modulation as رحمة, shifting from an abstract adjective into a culturally resonant noun phrase. This reflects the translator’s strategy to improve readability while preserving the scientific tone of the original.

The previous examples demonstrate that the translator resorted to using more than one technique of translation when he faced structural and terminological difficulties in scientific texts, and he employed a flexible and context-driven manner. Borrowing, rankshift, and modulation were applied based on the demands of each sentence—whether to preserve technical meaning, restructure syntactic form, or improve cultural readability.

The translator's choice of translation techniques reflects his awareness of both scientific accuracy and reader accessibility. Rather than following a fixed pattern, decisions were made case by case, depending on structural complexity, term specificity, communicative intentions, and the level of familiarity for the target audience. This strategic adaptability is crucial in scientific translation, where preserving meaning and ensuring clarity must be balanced carefully.

6. Conclusion

This research paper studied and discussed how rankshift and borrowing strategies were used in the Arabic translation of the Demon-Haunted World by Carl Sagan. With a comparative method of analysis, ten examples were tested carefully. Consequently, the following observations can be reached:

- When there is no equivalent Arabic item or in case a literal translation could cause problems (such as a semantic ambiguity) in presenting the original meaning without any changes, the translator used borrowing-partialor cultural.
- When there were complex structures or sentences, the translator was obliged to simplify them into short and understandable ones in Arabic, via the use of rankshift and other supporting techniques.

- The translator was always trying to keep adequacy, and at the same time, make it easy and even for the Arabic general readers- often by combining more than one technique together, in addition to the use of explanation when needed.

In conclusion, the study suggests that successful scientific translation needs flexible methods and translation strategies that suit variant cultures and languages. It also highlights the importance of adapting multiple strategies to deal with both linguistic and conceptual difficulties in the process of transferring knowledge across two diverse cultures.

7. Recommendations

On the basis of the findings, this study recommends the following suggestions:

1. Give clarity more attention than literal translation (literalism).

2. When borrowing strategies are necessary, they should be applied with care.
3. Flexible and mixed translation techniques must be integrated into translation programs.
4. This study also recommends the use of comparative analysis to teach students how to select appropriate strategies, in line with Nord's (2005) framework for Skopos Theory.

5. Zheng (2017) emphasized the need for continual updates to Arabic technical lexicons to reduce excessive reliance on borrowing.

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