

Raymond Hickey, *Life and language beyond Earth*. Cambridge: Cambridge University Press, 2023. Pp. iii + 694.[‡]

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Between 1899 and 1901, Jean-Marc Côté and other French artists were commissioned the task of drawing on postcards what life might look like in the year 2000. Some predictions, like the fact that humans would live under water or that there would be flying cars available for public use in the new millennium, were decidedly far-fetched. Others, like the prediction of electric dusters for domestic use, the automation of labour-intensive farming processes, the invention of house trailers and the introduction of video-calling technology, were astonishingly specific and correct. The drawings, which are now widely accessible on the internet, are nothing less than mesmerising for twenty-first century audiences. They evoke a sense of wonder about how far our visionary intelligence can take us. Simultaneously, some amusement arises from certain details within these drawings, such as the stubborn use of early twentieth-century clothing style, which remains crystallised in the cultural milieu of the time.

Although not solely concerned with future predictions of our linguistic interaction with the universe, Raymond Hickey's book, *Life and language beyond Earth*, might instil a similar sense of wonder, tinged with amusement, among present-day and future readers alike. This review summarises some of the most salient points in Hickey's book, *Life and language beyond Earth*, from a linguistic point of view and adds to the discussion provided in the book by pointing to a potentially promising path to be followed for investigating linguistic features in exolanguages, albeit from a purely theoretical point of view. In particular, I suggest that mathematical structures and logic may be a promising starting point for exploring similarities between exolanguages and our own languages on Earth, since, should there be other forms of intelligent life beyond our own, all languages in the universe would be bound to the same mathematical laws. Exploring the correlation between language and mathematics might encourage us to add more properties to our understanding of language universals.

Hickey's thought-provoking book, *Life and language beyond Earth*, is an original, visionary description of the (admittedly limited) knowledge we have so far about the birth and development of the universe and the rise and evolution of life on Earth. It also discusses humanity's search for life on other Earth-like planets and ponders about the possible existence of languages used by intelligent beings living on a remote Earth-like planet. Although this is a lengthy book, comprising 694 pages, it is written

[‡] The online version of this article has been updated since original publication. A notice detailing the changes has also been published at <https://doi.org/10.1017/S0022226724000161>

in an engaging way, using relatively simple vocabulary and guiding the audience through detailed descriptions of more technical aspects. The length of the book has probably contributed to the fact that the discussion is sometimes repetitive, and while the author might have explicitly decided to insist on key facts in order to aid his readers' memory, one cannot help but experience a confusing sense of *déjà-vu* when approaching the book from beginning to end.

Some of the repetition is, however, justified by the need to boil down the long text to a few key conclusive points. To this end, the book features an appendix entitled 'A possible roadmap to exobeings', containing a brief summary of the possible pre-conditions which might lead to the rise of intelligent life on exoplanets; another appendix, entitled 'A possible roadmap to exolanguage', contains reflections on how an exolanguage might emerge and what its basic features might be; a glossary provides definitions for some of the most technical terms available not only in linguistics (e.g. 'alphabet' and 'adjective') but also in other non-linguistic disciplines (e.g. 'genome' and 'RNA'). There is also a 'timeline' section that provides details of factors leading to the appearance of us humans on Earth, focusing on events that were advantageous to our survival. The bibliography is organised by topic, following two main strands, namely, 'general' and 'language and linguistics', thus allowing readers to follow up on any topic of interest easily by identifying relevant subsections (e.g. 'language, society and culture' and 'space exploration').

The volume is divided into six parts, which provide an effective framework for allowing readers to follow the author's line of thoughts coherently. In Part I, Hickey poses some essential questions about exolife, discussing possible assumptions about the presence in the universe of exobeings (broadly intended as intelligent living beings located outside of our planet) and the implications of a future signal from them aimed to Earth. Part II provides the reader with an overview of some recent astronomical discoveries, including issues relevant to the search for Earth-like planets. Part III gives information on the evolution of life on Earth, discussing how complex life forms evolved from earlier, simpler organisms, which, in turn, stemmed from single-celled life forms. Part IV discusses the possibility that intelligent life forms living elsewhere in the universe will have a 'physical substrate which is functionally and structurally comparable to our brains' (19). Part V focuses on the nature and function of human language, while Part VI makes conclusions about how similar exobeings could be to humans and the likelihood of them following similar evolutionary routes to those known to us. The overall aim of the final part of the book is to encourage speculation on the chances of us Earthlings (rather than a specific nation) meeting exobeings and, if direct contact is not possible, how our long-distance linguistic interaction with them might occur.

Although we are still far from establishing contact with any exobeings, this book is justified by the fact that 'there are millions and millions of potentially life-bearing exoplanets just in our galaxy, orbiting about the hundreds of billions of stars of the Milky Way' (122). It is evident, therefore, that we have to be prepared to think about language as a cognitive feature not exclusive to Earthly beings. Any book attempting to discuss such a daringly novel topic is likely to provoke two extreme reactions: there

will be those who will find the topic highly interesting, timely and appropriate; and those who will complain about the speculative nature of some of the arguments made in the book. My position leans more towards the first envisaged group, which sees the book as a welcome contribution to linguistics. While this book is not free from weaker aspects that deserve some criticism, I believe that discussions about possible languages outside Earth, like those pioneered in this contribution, might ultimately stimulate us, as human beings, to reflect about our own linguistic nature in ways that we would otherwise not be able to do. In this sense, I disagree with the author's statement that 'if there is no life beyond Earth then there are no languages beyond it either, and this book would be pointless' (31).

One way in which this book stimulates further thinking is through the (somewhat understated) distinction made throughout the volume between communication between humans and exobeings on one hand, and communication among exobeings on the other hand. While we will likely not be able to immediately understand exolanguages belonging to exocivilisations comparable to ours in terms of intelligence and technological advancement, and we might struggle to decipher them, it is possible that these exolanguages, as systems of communication among exobeings, would be quite similar to human languages in their own internal structure. There are logical reasons to believe so. Since physical laws apply everywhere in the universe, mathematics is also likely to be a requirement for any exolife with advanced enough technology to be able to seek communication with us. And given that language is known to have mathematical aspects in its structure and logic (see, for example, the arguments made by the American Mathematical Society Proceedings 1961 and Keenan & Moss 2016), linguists, I argue, should focus on furthering our understanding of language as a mathematically driven structure of communication in order to bridge any gap between human languages and exolanguages. Such an approach would likely involve intensive collaboration among scholars in cognitive linguistics, applied mathematics and evolutionary biology. Ultimately, it is possible that patterns existing in language universals may be dictated not only by the neurobiological makeup of human beings, but also by fundamental mathematical laws applicable to the entire universe.

While Hickey's book, *Life and language beyond Earth*, does not touch upon the idea of a fruitful connection between mathematics and language, as I briefly postulated above, many of the conclusions made in it are based on potential similarities between human languages and exolanguages. The arguments made in the book follow Occam's razor's logic, a scientific principle stating that 'one should not assume more than it is necessary for explanation' (55). The author argues on the same page, 'by considering the language faculty and languages among humans on Earth we can consider possibilities about what languages on exoplanets might be like, if these exist'. The author is aware that by narrowing down our expectation of what exolanguages might look like, we will also inevitably have quite a myopic approach to the topic. He argues that:

[f]or some readers, the approach I have adopted might appear too anthropocentric, showing a bias towards life forms similar to us Earthlings. But we need

to bear in mind that life forms on an exoplanet will have arisen through Darwinian evolution over hundreds of millions of years and, in this long process, organisms will have developed which are functionally comparable to those on Earth. And if there are planets with exobeings then the latter will also have evolved structures which are functionally comparable to our brains (31).

Some of the most interesting linguistic claims made by the author following Occam's razor's principle are the fact that, since the presence of oxygen in the atmosphere is a requirement for carbon-based beings to survive, then exobeings would likely have developed a way of in-taking oxygen as a source of energy, which, in turn, means that they could possibly avail themselves of lungs – or something equivalent to them. There are also good reasons to assume that exobeings would be able to hear sounds in the frequencies that we are able to perceive (20 hertz and 15,000 hertz). The most commonly available sounds in nature are within these frequencies, and for exobeings to have been able to defend themselves from possible predators and from the elements during the course of their evolution, they would have needed to hear these sound frequencies. Other features that might be found in exolanguages, following Hickey's reasoning, include the recognition of objects and beings, evidenced by the establishment of different grammatical categories for them; distinctions between singular and plural; the identification of three-dimensional spatial directions, identifiable by the use of (equivalents to) prepositions; the presence of means to establish temporal indications (the past, the present and the future), in combination with the use of words which express states or actions (590–591). These assumptions are made on the basis that exobeings would likely interact with their environment in ways that are similar to ours, though I admittedly have reservations on whether any exolanguages might internalise structural linguistic features in such strikingly human-like ways as those identified by the author.

Building on the analogy between human languages and exolanguages, Hickey also argues that, just like on Earth, different languages might have different statuses, which means that it is possible that we would come in contact with only an example of the exolanguages available on an exoplanet (591–592). Claims are also made that exolanguages could be subject to diachronic change like our languages on planet Earth. The causes of change could be both internal, involving variation arising from inter-generational transmission, and external, arising from pressures exerted by societal factors (600). Since these suggestions may be too specific to be postulated while we still do not know anything about how any exocivilisations could be organised, it would have been advisable to make more explicit references to theoretical frameworks in evolutionary linguistics and how these intersect, say, with issues arising from sociolinguistics. Although references are occasionally made in the book to specific theoretical concepts, for example, Chomsky's discontinuity hypothesis, which 'posits a sudden point at which modern language, with hierarchical syntax, arose due to a "rewiring of the brain"' (626), these do not give us an indication of whether we can reliably establish such

specific similarities between human languages and any exolanguages like those posited in the book.

The example of Jean-Marc Côté's postcards given at the beginning of this review, however, serves as a reminder that even some of the most oddly specific predictions can be accurate. Whether Hickey is right or wrong, in this case, only future (and, perhaps, applied mathematics) will tell.

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Andreas Kehl, *Adjunct islands in English: Theoretical perspectives and experimental evidence* (Studies in Generative Grammar 152). Berlin & Boston: Walter de Gruyter, 2023. Pp. xv + 330.

Reviewed by FANJUN MENG , Beijing International Studies University

Syntactic dependencies constitute one of the core properties of human languages. Despite no competence-based limitations on the distance for dependency formation, there are certain domains, best known as islands, where extractions are apparently prohibited. One famous island is the adjunct. According to Huang's (1982) Condition on Extraction Domains (CED), adjuncts as nonproperly governed constituents are opaque for extractions, and the grammaticality judgment as such is categorical or binary; however, counterexamples with different degrees of acceptability are attested, and the status of adjuncts as prototypical strong islands has been challenged repeatedly. Unfortunately, most explorations of island constraints and their exceptions have been theory-oriented, primarily based on intuitive judgments and rarely testified by a