Book review

Review author's name and affiliation:	Robert Truswell, University of Ottawa
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You can learn a lot about the *Cambridge Handbook of Biolinguistics* (henceforth *CHB*) from just the table of contents. The first impression is one of diversity. There is diversity of subject matter: is there any other field in which chapters on fossils would sit alongside chapters on birdsong, experimental methodology, benefits of bilingualism, and the intellectual antecedents of a nascent discipline? There is also diversity of writing style: Millotte et al's chapter on word learning and prosody is eight pages long, in the classic tradition of the cognitive science review article; Wexler's chapter is a spectacular 35-page position piece.

But what really stands out from the table of contents is this: *the bibliography is 132 pages long*. Almost 20% of this 676-page volume is a list of works cited. The bibliography is longer than *Syntactic Structures*, and almost as long as *The Modularity of Mind*. Of course, handbooks are meant to be compendious, and to review the extant literature in the area, but even so, this is enormous. In the same series, only 9% of the *Cambridge Handbook of Second Language Acquisition* (Herschensohn and Young-Scholten 2013) is bibliography. Elsewhere, the bibliography occupies only 7% of the *Oxford Handbook of Compositionality* (Werning et al. 2012).

Why is this bibliography so big (and, for the record, unwieldy: you need a couple of minutes to find an average reference, and the *B*s alone go on for 15 pages)? Of course, there is no definitive answer to this: the bibliography is the size that it has to be, according to the rules of citation etiquette. However, I have some hunches. In fact, I believe it is indicative of much that is currently exciting and daunting about the biolinguistic enterprise.

In short, I think that the bibliography is enormous, not because this is a handbook, but because its subject matter is biolinguistics. Given the current state of the field, one useful contribution to biolinguistic research is enlightened synthesis: pull together disparate ideas, because no-one can keep on top of everything that's out there. One consequence of this approach to research is inevitably a huge, groaning, bag of references. I'm sure enormous bibliographies exist in other disciplines too, but they must at least sometimes reflect attempts to synthesize a diverse group of current ideas, and I wouldn't be surprised to find that that is a particularly common way for biolinguists to work.

That is not to say that *CHB* necessarily represents such a work of synthesis. Of its 2,228 references, the vast majority (around 93%) are only cited within a single chapter. This is unsurprising: we are, after all, talking about an average of four new references on every page; or 93 per chapter, not counting the slim introduction. There has to be some text between all those references. However, given that most chapters are intended as reviews of a particular subject, this tells us that experts in one area don't necessarily know much about the rest of biolinguistics: paleolinguists may not know the first thing about Bengalese finches, or categorial perception, or how to interpret an ERP plot, and really, why should they?

As a result, although *CHB* is not a particularly weighty handbook, it is an incredibly dense read, as each chapter tries breathlessly to cram an entire research programme into a handful of pages. The cumulative effect can feel a little like *Phone call to the 14th century*, the fictional NPR game show in which contestants have one minute to impart as much 21st-century wisdom as possible to the people of the dark ages ("Wash your hands! Boil your water! There's no such thing as witches: everybody floats!"). Here, rather than veering from hygiene to witchcraft, we veer from birdsong syntax (ch.22) to computer simulations of the evolution of communication (ch.23). Biolinguists have to be comfortable flitting between such diverse subjects, as is mandated by their belief that such pluralism is necessary to address questions as intractable as the genetic underpinning and evolution of the language faculty.

Because *CHB* is so dense, I will make no attempt to produce an (even denser) overview of the contents here, or discuss individual chapters in any depth. Here, though, is a very brief outline: the chapters are grouped thematically into four parts: we begin with four chapters containing an introduction plus overviews of the historical development and philosophical underpinnings of biolinguistics, followed by six chapters on aspects of language development (Part I), ten on "mind, brain, behaviour" (Part II), and five on language evolution (Part III). The different themes are quite encapsulated from each other, but a further theme, invisible from the above, oncerns the genetics of language, addressed in chapters by Wexler (ch.8 in Part I), Benítez-Burraco (ch.20 in Part II), and Balari et al (part of ch.25 in Part III).

Most of the chapters are original reviews, either of an author's own work or of a general field. Two chapters (ch.16 by Pylkkänen et al, and ch.17 by Marcus et al) are reprints of pertinent earlier articles. Most of the chapters seem to fit well into the general perspective of the handbook, although the chapters on bilingualism and executive control (ch.10, by Hernández et al) and experimental syntax (ch.11, by Sprouse and Almeida) appear as outliers in the volume, whatever their individual merits. Likewise, there is a fair amount of redundancy in the inclusion of two historical chapters (chs.2 and 3, by Jenkins and Piatelli-Palmarini, respectively). These are minor quibbles, though: editing a volume of this size necessarily involves letting the chips fall where they may to an extent.

In part because of the sheer breadth of material in *CHB*, any linguist (indeed, any cognitive scientist) will surely find ideas in here to pique their interest. Moreover, the organization of the volume is logical, roughly mirroring the following five central questions attributed to Chomsky and enumerated at the start of Boeckx & Grohmann's *Biolinguistics* Manifesto:

1. What is knowledge of language?
2. How is that knowledge acquired?
3. How is that knowledge put to use?
4. How is that knowledge implemented in the brain?
5. How did that knowledge emerge in the species? (Boeckx and Grohmann 2007:1)

Nevertheless, the handbook, read from cover to cover, at times has an odd, somewhat disjointed feel: the same topics (FOXP2, Broca's area, Specific Language Impairment) recur in several chapters, but crossreferences are vanishingly rare, and authors seem unaware of how their statements relate to others made elsewhere in the handbook ('Language processing data from functional neuro-imaging in healthy adults converge on the finding that Broca's area is crucially involved in the processing of syntactic dependencies', Tsimpli, ch.5, p.56; 'although there has been much discussion of the role of Broca's area in syntactic computation, especially during

comprehension, there is little evidence supporting the claim for any linguistic-specific computation performed in Broca's region', Hickok, ch.18, p.347). Moreover, there is relatively little detailed linguistics in *CHB*; that is, question 1 from the above list is largely unaddressed here. The core of the handbook (chs.13–16) is a series of chapters on computational primitives in phonology/morphology/syntax and possible neural correlates, complemented by Pylkkänen et al's chapter on semantics and cognitive neuroscience. However, a nonlinguist would struggle to reconstruct much linguistic theory from the hints in these chapters.

There are other areas that I, personally, would love to see feature more prominently in biolinguistic research, and which don't feature here. For instance, the handbook could be enriched by chapters developing the suggestion in Hauser et al. (2002) to investigate comparisons between linguistic computation and computations underpinning other cognitive domains (the abstract for Hauser et al.'s paper mentions number, navigation, and social relations; comparisons with several other domains have featured in research by authors as diverse as Jackendoff and Gallistel). Likewise, there are two methodological sections in *CHB*: the chapter by Sprouse and Almeida on experimental syntax, and the methodological appendix to Monahan et al's chapter on computational primitives in phonology, which contains a brief overview of cognitive neuroscience methodologies. This far from exhausts the methodologies pertinent to biolinguistics, and a series of chapters on how to do biolinguistics could well be of use (for example, I would have benefited from a primer on the genetic concepts underpinning Benítez-Burraco's two chapters, which left me feeling particularly blinded by science).

I do not intend the above to be taken as a criticism of this handbook. Handbooks are not necessarily meant to be read cover-to-cover, and many of the individual chapters here are excellent. Moreover, it is clear that a handbook of biolinguistics could be absolutely enormous, and eventually practical matters like page limits will force editors to focus in some places at the expense of others.

Above all, though, I would argue that to the extent that this handbook feels disjointed, it is because biolinguistics is still in the process of crystallizing as a discipline, as invigorating and frustrating as that may be. To see what I mean by this, consider the following: linguistics is an interdisciplinary field. A standard linguistics undergraduate will have been exposed to everything from acoustic phonetics to first- or higher-order logic, via variationist sociolinguistics, language description, possibly an introduction to research in the psychology or philosophy of language, and so on. There is no one way of doing linguistics, any more than there is one way of doing biolinguistics. And yet linguistics feels like a single discipline: it is quite reasonable, for instance, to expect someone with a specialization in semantics to be able to get something out of a phonetics talk, and *vice versa*. We have linguistics curricula which generate linguists, capable of engaging with a whole range of linguistic issues.

In contrast, we don't yet have biolinguistics curricula generating biolinguists (a glance at Piatelli-Palmarini's "Design for a curriculum in biolinguistics" in ch.3 should be sufficient to convince anyone of the gulf between what is currently taught anywhere and what would constitute a reasonably complete biolinguistic training). Rather, we have people trained as linguists (typically), or occasionally psychologists or philosophers or biologists, looking at the bigger picture beyond the usual confines of their discipline. Only a handful of schools seem to provide an environment which reliably nurtures even this level of interest in biolinguistic questions (Maryland and Edinburgh stand out particularly, to my mind). It would surely be transformative for biolinguistics as a discipline if curricula anywhere near as broad as Piatelli-Palmarini's were to be taught, but the practicalities look daunting, and the reality is that very few people indeed possess that kind of breadth of expertise at present.

So whereas a typical handbook has its own ready-made audience (to come back to the examples mentioned above, the *Cambridge Handbook of Second Language Acquisition* has a core audience of SLA researchers, and further appeal to people in neighbouring disciplines; the *Oxford Handbook of Compositionality* will appeal primarily to syntacticians, semanticists, and philosophers of language, for whom compositionality is bread and butter), *CHB* doesn't have that luxury. Rather, it comes across as a series of invitations to theoretical linguists to reach beyond the usual business of theoretical linguistics, or to frame their theoretical inquiry in this particular perspective. This surely has to be welcome: theoretical linguists are notoriously hopeless about communicating to others why we are interested in our silly little theories, and our field suffers badly as a result, with the popular agenda often bypassing us altogether. As well as its intrinsic interest, a biolinguistic perspective can make theoretical linguistics less dry to the uninitiated. As an example, I was teaching an intro to syntax as I was reading through this handbook, and threw in a couple of classes on comparative material related to chs.21–2 here (by Zuberbühler and Okanoya respectively), as a way of situating syntactic theory within a wider context. The result was a noticeable spike in interest from students who had steadfastly refused to find Subjacency life-affirming. The moral of the story is that theoretical linguistics becomes more accessible when situated in this broader context, new questions open up, and things just become more exciting. If biolinguistics is becoming a buzzword, at least in certain circles, this is surely why: material like this can provide a shot in the arm for theoretical linguistics.

Having said that, many of the chapters stay well within linguists' comfort zone: most of part II, on language acquisition and development, and most of part III, on language in the mind and brain, could fit comfortably within a handbook of psycholinguistics. Other chapters (mainly those in part IV, as well as earlier chapters by Wexler and Benítez-Burraco) range further afield, by comparing modern human cognition to the cognitive capacities of other species or of our ancestors, by discussing models of the evolution of language and communication, or by engaging with aspects of the genetics of language, and even those chapters on more traditional linguistic topics often offer a distinctively biolinguistic slant (the aforementioned series of chapters on computational primitives certainly appears to have been intended that way).

The handbook does seem very much designed as a tool for linguists, rather than a tool aimed at fostering an equal collaboration between linguists and researchers in other disciplines. This is evidenced by the relative lack of linguistics in the volume, and the fact that greater familiarity with linguistic theory is presupposed than, for example, primatology. Curiously, this also means that the handbook covers material that is largely complementary to the research reported in the journal *Biolinguistics*, also edited by Boeckx and Grohmann. 11 articles from *Biolinguistics* are cited here, but roughly half of these are manifestos, reflections on the state of the field, and so on. The reason for this, it seems to me, is because there is more theoretical linguistics in *Biolinguistics* than there is here. This is probably for the best: an invitation to further engagement in this kind of research is probably more appropriate at this stage than a recapitulation of *Biolinguistics*-style material in a handbook.

This apparent focus on encouraging specifically linguists to engage with biolinguistics also reflects a basic property of biolinguistics: it is just too big a subject to fit in a handbook without trivializing it. In fact, it is notable, particularly reading through the historical chapters in Part I, just how many of the seminal biolinguistic developments have their roots in discussions between experts in different fields. Most of these involve Noam Chomsky: a surprising example of the impact of biolinguistics on linguistic theory comes with the development of the Principles and Parameters model on the basis of an analogy with a biological model, apparently developed largely during a series of seminars and discussions bringing together biologists and linguists in

the late 1970s. Equally, it is Chomsky's interactions with two biologists that led to Hauser et al. (2002), the most cited work in *CHB* by some margin (incidentally, the three next-most frequently cited works in the handbook are Chomsky 1995, Chomsky 1965, and Chomsky 2005, an indication of the extent to which biolinguistics is still moulded in Chomsky's image. I would contend that this is due in part to his longstanding readiness to enter into dialogue with researchers in other disciplines, a distinctive aspect of Chomsky's approach to research which shines through in Part I of *CHB* and is arguably at odds with the widespread perception of Chomsky among nonlinguists).

So whereas most handbooks aim to communicate the state of the art in a given field, and provide a way in for interested outsiders, I prefer to think of *CHB* as a catalyst: almost everyone is an outsider when it comes to biolinguistics, with the vast majority of interested parties being specialists in only a small subset of the core subject matter (as McGilvray accurately remarks in his chapter, "biolinguistics" is something of a misnomer, as the discipline is much broader than the simple intersection of biology and linguisics. The name plausibly has historical interest, insofar as the roots of biolinguistics lie in discussions between linguists and biologists, and even McGilvray's 'very awkward' "bio-chemico-physico-compulinguistics" stops short of really encompassing the breadth of the subject matter). It may even be premature to say that there is a state of the art in biolinguistics. Rather, there is an approach to research, suggested by Hauser et al. (2002) and Chomsky (2005) (those papers again!), as well as older papers like Pinker and Bloom (1990), which appears to be producing promising, interesting results, a decade down the line. If, historically, biolinguistics grew out of interdisciplinary exchanges, we might hope that *CHB* will encourage more linguists to seek out such exchanges in future.

In sum, this is less a conventional handbook than an energetic, committed attempt to lay out a good chunk of the raw material on the basis of which a "future science of biolinguistics" (Tecumseh Fitch's term) may be formed as mainstream theoretical linguistics and neighbouring disciplines become increasingly intertwined (note also David Poeppel's comment, on the back jacket, about 'the *potential* for *future interdiscipinary progress*' — emphasis added). Taken in that sense, there is much here to interest and stimulate linguists of all stripes. If you are looking for a conventional handbook for this vast area, I don't expect this to be anything like the last word, but rather a snapshot of a discipline still in the process of coalescing.

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