Journal of World Languages, 2014
Vol. 1, No. 3, 232–241, http://dx.doi.org/10.1080/21698252.2014.989942

Routledge
Taylor & Francis Group

The logical nature of Systemic-Functional Grammar and "grammatical logic"

Zongxin Feng*

Department of Foreign Languages and Literature, Tsinghua University, Beijing 100084, China

(*Received 3 November 2014; Accepted 17 November 2014*)

In view of the close relationship between logical and grammatical studies in the history of linguistics, this paper highlights the logical nature of Systemic-Functional Grammar, which is characterized with "grammatical thinking" and based on "grammatical logic" rather than symbolic/mathematical logic. It discusses some of the essential characteristics of grammatical logic and concludes that such a naturally evolved logic parallels with, but is more accommodative and explanatory than, the artificially designed logic.

Keywords: logic; grammar; grammatics; grammatical logic; fuzziness

1. Introduction

"Logic" has been a very important thread in the matrix of the Systemic-Functional Grammar. For one thing, Halliday has identified a "logical component" in the linguistic system which is distinguished by the fact that "it is expressed through recursive structures, whereas all the other functions are expressed through nonrecursive structures" (1978, 48). For another, with a specific view of grammatical theory, he models natural language and uses grammar as a kind of "logic", which is not just "a theory about grammar" but also "a way of using grammar to think with" (2002, 416). For still another, he has developed his theory in a logical mode in the modern sense, both as a grammar and as "a grammar of grammars" (2002, 365).

Halliday does not care for formal logic because his theory is first of all "a social semantics", which he believes to be, and must be, a "polysystem, a set of sets of options in meaning, each of which is referable to a given social context, situation type or domain" (1978, 79). In developing "a theory of experience" and "a theory of theories of experience", Halliday has proposed the concept of "grammatical logic" (2002, 402), which is also a semiotic system, as mathematical logic is. He says that although "logic" is the source from which formal logic is derived, "grammatical logic" is different; the two semiotic systems are complementary and in some contexts we may need "the evolved logic of grammar rather than, or as well as, the designed logic of mathematics" (416). A major characteristic of his theory is that it "explains the grammar by mimicking its crucial properties" (402) and is thus a theory of grammar and a theory of theories of grammar.

2. Grammar and logic

Grammar has been closely related with logic in the history of linguistics, at least in the classical trivium, which also included rhetoric. As a formal discipline established by

*Email: zxfeng@mail.tsinghua.edu.cn

Aristotle, logic had a fundamental place in philosophy. In spite of de Saussure's (1993, 1–2) statement that traditional grammar invented by the Greeks and carried on unchanged by the French "never had any philosophical view of a language", Greek grammar developed in a context of "philosophical and particularly logical enquiries", and "the linguistic science of the Stoics formed a part of their general philosophical system" (Robins 1997, 22) and grammar in the modern sense only began with the Stoic philosophers, whose philosophical attitude led them to pay attention to language (1997, 34). Helias (1100–1166), one of the first grammarians who brought "some systematisation into earlier rather unordered statements", sought "philosophical explanations" for the rules of grammar in the Latin grammarian Priscian's *Institutiones grammaticae* and provided a "theoretical basis of grammar" as distinct from "mere exposition to schoolboys". In so doing, Helias consolidated the role of the philosopher in grammar: "It is not the grammarian but the philosopher who, carefully considering the specific nature of things, discovers grammar"; "As is the fool to the wise man, so is a grammarian ignorant of logic to one skilled in logic" (Robins 1997, 90).

From mediaeval scholastic grammars to rationalist grammars in the seventeenth century, logic was the key to a general theory of grammar. For instance, logic "had its greatest influence on linguistics" in the case of the Port-Royal Grammar, a pioneering work of general and rational grammar (Robins 1997, 141). The fact that Antoine Arnauld (1616–1698) was the first author of both the *Grammaire générale et raisonnée* (1660) and *Logique de Port-Royal* (1662) can footnote the *Grammaire* as a linguistic counterpart or companion to the *Logique*.

Petrus Hispanus (1210–1277) made the distinction between *significātiō* and *suppositiō* as separate but related semantic properties of words in his *Summulae logicales*, which led some logicians and grammarians to make a further distinction between "formal supposition" and "material supposition": "a word stands for or is accepted for a thing, person, etc." and "the word stands for itself" (Robins 1997, 91). This forebodes the modern logician's distinction of the first-order language and the second-order language, which led modern linguists to differentiate the object language and the metalanguage, enabling them to describe language and linguistic systems with language.

Logical grammarians had limited views of not considering the language as a whole from the perspective of modern linguistics, but their philosophical insight and logical methods enabled them to rightly discover grammatical units and their relations, producing useful metalinguistic terminologies that are still in use in present-day linguistics.

In *The Logical Structure of Linguistic Theory*, Chomsky (1975, 57) says that the fundamental notion of syntax is "grammatical"; its primary concern is "to determine the grammatical sentences of any given language and to bring to light their underlying formal structure"; and its goal is to "show that the complexity of natural languages … can be analysed into simple components". Halliday (1978, 4) highly values Chomsky's immense achievement in having successfully shown that "natural language can be reduced to a formal system" and that language can be represented "not only as rules but even as ordered rules". But in the case of the "social man" rather than the idealised speaker, "the ordering disappears and even the concept of rules is seen to be threatened". Halliday believes that all linguistic systems are equally "logical", but may differ in their semantic organisation (1978, 85). Chomsky (1975, 57) sees semantics as another subdivision of linguistics that is "concerned with the meaning and reference of linguistic expressions", but does not directly deal with it since "it is unknown … how much syntax and semantics can draw from each other".

Although natural language can be neatly represented by highly abstract and generalisable structural rules and human uses of natural language can be formally represented, certain linguistic facts cannot be adequately accounted for simply by logical rules. Modern logic has provided important methods for analysis of linguistic expressions (e.g. modals and logical connectives), but it has done little semantic analysis or worked out a general theory about them in natural language. If a linguistic theory aims to account for meaning-making, it has to be logically grammatical and grammatically logical.

3. The logical nature of Functional Grammar

Taking "language as social semiotic", Halliday (1978) aims to develop a functionalist theory of human experience as construed in grammar, from all possible aspects. From his observation that "there is no doubting the logic of all linguistic systems" (1978, 85), Halliday has consistent logical perspectives in his functionalist account. I have discussed (Feng 2012a) the highly logical nature of Systemic-Functional (SF) grammar in terms of its logical perspectives, logical systems in the descriptive network, logical semantic relations in grammatical structure and absorption of modern logic, especially modal logic. Here, I would further elaborate on three aspects in which Halliday's grammatical theory is "logical" in the modern sense.

3.1 The logical metafunction

Halliday (1978) identifies the "logical structure" as one of the four components in the grammatical structure of language, since language has to express certain elementary logical relations, like "and", "or" and "if", as well as those created by language itself such as "namely", "says" and "means" (21). He divides the first of the three metafunctions ("ideational") into the "experiential" and the "logical", making a distinction between the "content" function of language and something in the linguistic system that is expressed through recursive structures (1978, 48). He explains that the "logical" component is that which is expressed in the form of "parataxis" and "hypotaxis", including such relations as coordination, apposition, condition and reported speech. By regarding these relations as constituting the "logic" of natural language, Halliday makes a necessary distinction because logical meanings have "exclusively this linear recursive mode of expression" (1978, 49).

In the first and second editions of *IFG* (*An Introduction to Functional Grammar*), Halliday (1985, 1994) takes the "logical metafunction" as a subcomponent since the logical element in the linguistic system is "ideational". But to further the point that "once it is built into language the logical becomes neutral with respect to the other functions" (1978, 48–49), Halliday, many times in the revised editions, upgrades the "logical" as the first of the four metafunctions (e.g. 2004, 63) and specifically prioritises the "logical meaning": "A text is organised internally as patterns of logical, experiential, interpersonal and textual meaning" (2014, 43).

3.2 The metalanguage

The logical nature of "linguistic metalanguage" facilitates different levels of academic description and everyday communication (Feng 2005). Malmkjaer (1991, xi) writes, "If there is one thing that sets linguistics apart from other disciplines, it is the fact that its subject matter must be used in the description. . . . and a metalanguage is, in any case, also

a language". Halliday rightly makes the theory of grammar as "taking language as its metalanguage" (2002, 366). Apart from language expressing logical relations (e.g. *namely, means*), which are "metalingual" in the sense of "glossing" (Jakobson 1960), Halliday has developed a lot of terms in the sense of "language constructing language" (Taylor 2003), such as the four most basic categories (i.e. *unit, structure, class* and *system*) that are "of the highest order of abstraction", each being specifically related to and logically derivable from the others, "without any relation of precedence or logical priority" (Halliday 2002, 41).

Hjelmslev (1961, 119–120) found that there is "a semiotic whose *expression plane* is a semiotic" in addition to "a semiotic whose *content plane* is a semiotic", and "linguistics itself must be" such a semiotic that treats of a semiotic. In other words, linguistics has to be metasemiotics. Following the modern logician's dichotomy of the object language and metalanguage, Halliday (1978, 3–4) makes a "valid and important distinction" between the object and the instrument: for the linguist, language is object, and for others, language is "an instrument" (i.e. a means of illuminating questions about something else), making clear distinctions between phenomenon and metaphenomenon, description and metadescription, etc. For instance, on his observation that both words and things may "participate in the process", Halliday distinguishes between "what is perceived or felt or thought of" and "a phenomenon that has already been filtered through the medium of language". He explains that a metaphenomenon is a "representation at the semantic level" and a metaphenomenon is a "representation at the lexicogrammatical, or syntactic, level" (2002, 184–5).

Firth (1968, 169) pointed out that "Every scientific discipline must necessarily develop a special language adapted to its nature and that development represents an essential part of scientific work". Unlike some scholars that see metalanguage as "technical" terms (Robins 1997, 34) or the linguist's "jargon" (Wales 1989, 294), Halliday sees technical terms (e.g. *register, grammatics, semiosis*) as "not necessarily jargon", but "an essential part of constitution of scientific knowledge" (2014, 5). Halliday (2002, 296) is fully aware of the problem of interpreting a symptom and labelling its interpretation, which is "common to all sciences", and uses "a higher status code" to symbolise "a higher order of abstraction". He observes that in metalinguistic matters, linguistics presents a special case, but is not just another science, thus insisting that "where other sciences need two terms", linguistics needs three: one for the phenomenon and two for the metaphenomenon (i.e. grammatical and semantic). It is this logical and metalinguistic perspective that has scientificalised SF grammar as a linguistic and metalinguistic theory.

3.3 The meta-ness of theory and theory of theories

In developing a "functional account of English grammar", Halliday focuses on developing a general theory of grammar and a theory of theories of grammars, i.e. grammatics or metagrammar. He says that, while a grammar is "a theory of experience", a grammatics is "a grammar of grammars, a theory of theories of experience, or a metatheory" (2002, 365).

In the Introduction to *IFG*, Halliday (1985, i–xvi) notes that he takes English to manifest in the linguistic system "the two very general purposes which underlie all uses of language". As a result, he has developed a functional grammar of English in particular and a theory of functional grammar of languages in general. In so doing, he takes English (along with examples from some other languages) as both an object and a means of description. In a 1996 article, he puts forward a metagrammatical concept, "grammatics",

simply to "escape from the ambiguity where 'grammar' meant both the phenomenon itself … and the study of that phenomenon" (2002, 416).

Although Halliday declares that his approach leans towards the applied, rhetorical, actual and functional rather than the pure, logical, ideal and formal (1985, xxviii), his functional account of grammar is logically woven and formally expounded. By emphasising text analysis as "a mode of action" and a theory of language as "a means of getting things done", Halliday believes that paradigmatic functional grammars can also be "generative" in the sense of "being expressed in formal terms and used for generating or parsing by computer" (1985, xxix). He says that "talking about grammar" means "doing grammatics" or "using grammar to construct a theory about itself". Seeing a theory as a semiotic construct, he is confident in using a grammar as a resource for constructing theories just because "a grammar is itself a theory", and the construction of knowledge is "the transformation of experience into meaning" (2002, 391).

Some remarkable features of Halliday's theory lie in the logical *meta*-ness. His linguistic theorisation is not only significant for such concepts as "system", "function", "grammar", but more importantly, for higher logical levels of "system of systems", "function of functions", "grammar of grammars", "theory of theories". It is from his keen logical insight that Halliday has developed a grammar of a natural language in particular and of natural languages in general, which is a theory and a theory of theories.

4. Grammatical logic and its concerns

"Grammatical logic" is a theoretical term rather than a descriptive one and never appears in any edition of *IFG*. In a 1996 article, "On Grammar and Grammatics", Halliday says that it is "the evolved logic of grammar" rather than "the designed logic of mathematics" (2002, 416). He is aware that grammatical logic may lack the rigour of a mathematical theory, but insists that it can be "a source of strength" in being "more relevant to understanding other semiotic systems". In using the grammar to "think with about itself", he is not just using language as its own metalanguage in the usual sense, but in the sense of using grammatics "as a means towards understanding the nature and evolution of language as a whole" (366). Thus, his grammatics is a theory that "explains" the grammar "by mimicking its crucial properties" (402).

In looking into language "from the outside" and specifically interpreting linguistic processes "from the standpoint of the social order", Halliday (1978, 3–4) makes a contrast to the prevailing mode of linguistics in the past two decades that see "grammar" as "a set of rules" in the framework drawn from logic, where structural functions are defined by logical relations (e.g. subject and predicate) and linguistic relations are seen as formal relations between classes (e.g. noun and verb). Traditional grammarians recognised different functions of the "subject" as distinct but labelled it as if they were three different varieties under a superordinate heading: "psychological", "grammatical" and "logical". Halliday (1985, 33) keenly observes that in idealised clause patterns everything seems to be right, since the functions of the three all coincide; however, once we consider natural living language, these three concepts are not merely different aspects of one and the same general notion, but have to be "interpreted" as what they really are. Hence, he replaces them with the terms "Theme", "Subject" and "Actor" to differentiate "that which is the concern of the message", "that of which something is predicated" and "doer of the action" rather than on the distinction of "logical", which means "having to do with relations between things", and "grammatical", which were "relations between symbols" (Halliday 1985, 33–34, 2014, 79–80).

Although new knowledge on the evolution, development and functioning of the brain may possibly have no significance for the way linguists describe and explain language, especially at the "inner" strata of lexicogrammar and phonology and, although it may set certain constraints and favour certain explanations over others, Halliday (2002, 2–3) believes that it suggests grammatical logic rather than formal logic and fuzzy and probabilistic categories rather than clearly bounded and deterministic ones. Taking up Edelman's idea that "the brain is more like a jungle than a computer", Halliday (2002, 3–4) asserts that the brain "disfavours representations of grammar and phonology" in a computational sense. He writes that one "should use the unique power of the human brain to reflect on the way their experience is construed in their grammar: use grammatics to think about what grammar thinks about the world" (2002, 370); it is sensible "to talk about any condition being construed by the grammar", and those who "think grammatically" are enabled to "act grammatically, whether in developing forms of praxis for educational and other professional tasks" (383), or otherwise.

Webster (2002, 290) takes "grammatical logic" as what Halliday (2002, 387) expediently calls "grammatical energy" that powers language and explains that those who "think grammatically" will be better prepared not only to address issues of social injustice and inequality, but also to contribute to the development of new applications of linguistics such as intelligent computing. Matthiessen (2010, 109) lists three respects in which grammatical logic differs from modern symbolic logic: (1) it embodies indeterminacy, as a positive characteristic, (2) it has greater range of logico-semantic relations than that of logical connectives in (classical) propositional logic, and (3) it is based on consensus rather than on truth value. I have discussed the descriptive and explanatory powers of the modality system that focus on the positive values of intermediate choices between the polarities (Feng 2011b) and the ways in which SF grammar positively deals with indeterminacy and fuzziness (Feng 2012b). In a more recent paper (Feng 2013), I elaborated on some aspects of the "grammatical logic" in SF linguistics. Since Matthiessen also comments from a lot of sources that "aspects of the grammatical logic can be represented by means of Lotfi Zadeh's fuzzy logic" (2010, 109), I would like to focus on the ways Halliday draws from modal logic but rejects fuzzy logic in his explicit accommodation of fuzziness.

4.1 Embodiment of indeterminacy or fuzziness

As a general feature of natural language and therefore a major concern of SF grammar, Halliday noticed "indeterminacy" in the 1950s and resorted to "probability" and "approximativity" in coping with the large number of linguistic facts that cannot be adequately dealt with in terms of polarities. He holds that "probability" is not a "fuzzy" concept; but probability in grammar adds indeterminacy to the definition of a category (2002, 400). Hu (1990, 8) regards Halliday as the first to "analogise the probabilistic principle of informatics to the description of grammatical system".

While logicians borrow natural language to study the neatness and wholeness of formal systems, Halliday simulates and models on natural language in describing the linguistic system. Unlike traditional truth-conditional semanticists who did not care about fuzzy areas between entities, Halliday deals with indeterminacy in both natural language elements and their linguistic description (Feng 2012b). Unlike logicians and semanticists who only cared about truth or falsity, Halliday focuses on the validity of the values in between (Feng, 2012a). The most "logical" system in SF grammar, modality, has absorbed both traditional and modern logic, making use of the three terms in traditional modal logic

(i.e. *possibility, probability* and *certainty*) and extended terms in modern modal logic (i.e. *can, could, might, may, must*). His logical concept of "finite verbal operator" includes "temporal operators" and "modal operators" (Halliday 1985, 75).[1] One of the remarkable features of this system is not only ranges of intermediate choices between polarities, but also a factual discovery that "all modalities are in the positive ranges", with the explanation that there is no such thing as a "negative modality"; a modality is an assessment of probability and is not subject to negation (Halliday 1970, 333).

The first time Halliday uses the term "fuzziness", as I can find, is Halliday (1978, 114), as a logical rather than a sociological concept referring to "a departure from an ideal regularity" (rather than an organic property of socio-semiotic systems). For Halliday, the "fuzziness" of language is "in part an expression of the dynamics and the tensions of the social system". In my article (Feng 2012b), I traced Halliday's incremental uses of "fuzzy" or "fuzziness" in *IFG* and found twice in the first edition: "As with those that are projected verbally, so with those that are projected mentally the exact limits are *fuzzy*" (1985, 237); and "the line between conjunction and paratactic expansion is a *fuzzy* one" (1985, 318). In the second edition, there are two more times: "The line between a compound noun and a nominal group consisting of a Classifier + Thing can be very *fuzzy* and shifting" (1994a, 185); "Wanting something to be done means that it is envisaged, or projected, but may or may not happen: its status is that of a metaphenomenon, not a phenomenon. But the line between the two is *fuzzy*" (1994a, 289). In the third edition, there are six more times: "Word boundaries are somewhat *fuzzy*" (2004, 7); "both categories, orthographic word and grammatical word, are equally *fuzzy*" (9); "such (lexical) sets can be typically *fuzzy*, with doubtful or part-time members" (40); "in a grammatical perspective, as rather large and *fuzzy* closed systems or, in a lexical perspective, as somewhat determinate and limited open sets" (45); "the process types are *fuzzy* categories" (172); and "systemic terms are not Aristotelian categories" but "*fuzzy* categories" representing "*fuzzy* sets" rather than "crisp" ones (172). In the fourth edition, there are altogether 11 times, with a revised wording "such (lexical) sets *are* typically *fuzzy*" (2014, 61) against "can be" (2004, 40) and in addition: "English needs to be interpreted and described as an assemblage of varieties … with *fuzzy* boundaries" (2014, 73).

It is obvious that Halliday uses the term "fuzzy" as "indeterminate" in the first two editions of *IFG*. Terms such as "part-time members", "fuzzy categories", "fuzzy sets" and "fuzzy boundaries" appear only in the revised editions of *IFG* and the only work on fuzziness in References is Matthiessen's 1995 article "Fuzziness Construed in Language". Somehow, Halliday's own 1995 articles "On Language in Relation to Fuzzy Logic" *and* "Intelligent Computing" and "Fuzzy Grammatics: A Systemic Functional Approach to Fuzziness in Natural Language" are not listed.

4.2 Rejection of fuzzy logic

Preferring the term "indeterminate" to "fuzzy", an essential feature of language that the grammatics "should accommodate" (2002, 409), Halliday obviously keeps off fuzzy logic; and when he has to use the term "fuzzy" in a logical and computational sense, he only mentions it being borrowed "from its origins in Zadeh's 'fuzzy logic'" (399) and "deriving ultimately from" it (416). For Halliday, formal logic is "the designed offspring of grammatical logic, just as the written sentence is the designed offspring of the clause complex of speech" (2005, 176). He explains that mathematics and grammar both are semiotic systems but constitute different and complementary kinds of logic: the logic of numbers and the logic of wordings and meanings – linguistic logic. Just as mathematics

enables us to "manage the complexity of numbers", grammatics enables us to "manage the complexity of language" (250–1).

Holding that SF linguistics is "fuzzy grammatics" (2005, 227), Halliday does not care for fuzzy logic in the way of using natural language as the computational metalanguage. In spite of the highly logical nature of SF grammar, Halliday virtually cites no work of logic.[2] In the third and fourth editions of *IFG* (Halliday 2004, 2014), the only entry in the References is Ellis's *Language, Mind and Logic* (1993), a book that he had reviewed in 1995. In this review, Halliday writes, "Formal logic is irrelevant to the understanding of language: not because of the limitations of language but because of the limitations of conventional logic" (2003, 236). For Halliday, formal logic and mathematics can be seen as the result of "tidying up the indeterminacies of natural language grammars" (2002, 399). Since indeterminacy is an inherent and necessary feature of a grammar, to be accounted for, construing it is a matter of "managing the complexity". Although "computing with meanings" can depend on "reasoning and inferencing with fuzzy sets and fuzzy matching processes", he insists that natural language "requires a grammatics" (416–7).

In his incremental explicitness in using the term "fuzzy/fuzziness", Halliday never refers to the generative semanticist Lakoff's (1973) important study of fuzziness in reference to Zadeh's fuzzy logic, in spite of his commonness with him in using such terms as "prototype" (none in the first edition, but four times in all other editions of *IFG*), "fuzzy sets" and "fuzzy categories" in the revised editions of *IFG* and other articles. Lakoff points out that natural language concepts have vague boundaries and fuzzy edges and that, consequently, natural language sentences will very often be "neither true, nor false, nor nonsensical", but rather "true to a certain extent and false to a certain extent", "true in certain respects and false in other respects"; hence, any attempt to limit truth conditions for natural language sentences to true, false and "nonsense" will distort the natural language concepts which are not sharply defined but "fuzzily defined boundaries" (1973, 458).

By "hedges", Lakoff is concerned with the logical semantic systems of degrees of truth between "yes" and "no"; by "modal operators" and "modal adjuncts", Halliday is concerned with the modalisation system of the degrees of probability and usuality between "yes" and "no" and the modulation system of the degrees of obligation and inclination between "do" and "don't". At least in "negotiating information", Halliday and Lakoff are logically doing the same thing by validating the third type of values in the fuzzy areas between the positive and the negative.

Halliday is well informed and cites many people, including his colleagues and students, but not his Stanford alumnus Lakoff for even once in his own books and articles.[3] Lakoff's paper on fuzziness was written during his residence at the Centre for Advanced Study in the Behavioural Sciences at Stanford University from 1971 to 1972. Halliday was Fellow at the same Centre during a time when Lakoff read the paper at the Eighth Regional Meeting of the Chicago Linguistic Society in 1972 and had it published in the following year. It remains a mystery why Halliday neither cites nor comments on Lakoff's study on fuzziness.

5. Conclusion

As the scale of delicacy becomes finer and analysis goes into more depths, SF grammar accounts for more fuzzy areas in natural language. In spite of his preference of grammatical logic to formal logic, Halliday implicitly draws from the methods of modern logic. As new knowledge in relevant disciplines becomes available about how the human mind

works with natural language, Halliday is more and more open to fuzzy logic. From the perspective of grammatical thinking, he successfully accommodates fuzziness with the precision of grammatical logic in natural language. By simulating and modelling natural language, Halliday's theory has not only revealed how experiences are encoded in lexicogrammar and how grammar can construe them, but also how grammatics can explain the explained. As a naturally evolved logic, grammatical logic parallels with, but is more accommodative and more explanatory than the artificially designed symbolic logic. Since Halliday has squarely touched upon many important issues in different disciplines of modern logic, what he has offered is not only a general theory of natural language for the linguist, but also a linguistic logic for the logician and scientists in relevant disciplines for processing natural language.

Disclosure statement

No potential conflict of interest was reported by the author.

Notes

1. The Chinese language makes terminological distinctions. "Modal" is *mó taì* (模态) in logic and *qíng taì* (情态) in linguistics. Introductions to SF Grammar in Chinese (Hu et al. 1989, 122) put "modal operator" as the grammatical term *qíng taì dòng cí* (情态动词, "modal verb") instead of the logical term *mó taì suàn zǐ* (模态算子).
2. Only in Halliday and Matthiessen (1999), they cite Boole (1854) *An Investigation of the Laws of Thought: On Which Are Founded the Mathematical Theories of Logic and Probability*, Haack (1978) *Philosophy of Logics* and Kneale and Kneale (1962) *The Development of Logic*.
3. It is only in his collaboration with Matthiessen's *Construing Meaning Through Experience: A Language-based Approach to Cognition* (1999) that they cite six works authored by Lakoff, including his "Linguistics and Natural Logic" (1972) and "Cognitive Semantics" (1988). The revised third edition of *IFG* (Halliday 2004) only includes in the References Lakoff and Johnson's *Metaphors We Live By* (1980) without citing it anywhere and the fourth edition (2014) has removed it.

Notes on contributor

Zongxin Feng is Professor of Linguistics and English Language/Literature at Tsinghua University, where he teaches stylistics, pragmatics, semiotics, and narrative studies. His publications include theories of linguistics, stylistic analysis of literary texts, metalinguistic studies of narrative texts, fictional narrative and history, and translation studies, in *Semiotica* (Walter de Gruyter), *Narrative* (Ohio State University Press), *Neohelicon* (Springer), *Language and Literature* (Sage), and *Perspectives: Studies in Translatology* (Multilingual Matters/Routledge).

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