

Rhetorical Communication in the CogSci Discourse Community: *The Cognitive Neurosciences* (2004) in the Context of Scientific Dissemination

Lucia Abbamonte, and Olimpia Matarazzo

Abstract—In recent years linguistic research has turned increasing attention to covert/overt strategies to modulate authorial stance and positioning in scientific texts, and to the recipients' response. This study discussed some theoretical implications of the use of rhetoric in scientific communication and analysed qualitative data from the authoritative *The Cognitive Neurosciences III* (2004) volume. Its genre-identity, status and readability were considered, in the social interactive context of contemporary disciplinary discourses – in their polyphony of traditional and new, emerging genres. Evidence was given of the ways its famous authors negotiate and shape knowledge and research results – explicitly *appraising* team work and promoting faith in the fast-paced progress of Cognitive Neuroscience, also through experiential metaphors – by presenting a set of examples, ordered according to their dominant rhetorical quality.

Keywords—Appraisal, disciplinary discourses, experiential metaphors, genre, identity, knowledge, readability, rhetoric, strategies, theoretical implications.

I. INTRODUCTION

THEORETICAL accounts of scientific/specialized discourse impersonality and non-involvement have undergone considerable revision, and, by and large, fallen out of favour. In recent years linguistic research has turned increasing attention to covert/overt strategies to modulate authorial stance and positioning, and also to recipients' response. Features aiming at presenting facts from a non-neutral perspective have been identified, both at lexicogrammatical level and as rhetorical and discourse procedures, finalised towards persuasive effects: a fine-grained interplay usually takes place between the informational content and the discursive aspects of scientific texts – especially the more authoritative. Alan G. Gross, among others, [1] illustrated how the sciences construct their specialized rhetoric from 'a common heritage of persuasion' and create 'bodies of knowledge' so persuasive as to seem un-rhetorical, to seem, simply, the way the world is. It is a common belief that the

expectations of a discourse community determine the communication strategies and organization of a text and thus the meaning of a text is understood by reading it in the context of other texts..

Still, no discipline seems to be knowable independently of its discursive construction. And rhetoric is a significant part of it. This paper positioned itself on two levels: it discussed some theoretical implications of rhetorical strategies at work in scientific language, in the multifaceted context of scientific dissemination, and it analysed qualitative data from the text under analysis, *The Cognitive Neurosciences III* [2], edited by Michael S. Gazzaniga – a prestigious volume written by famous scientists, who are also 'in tune' with the communicating strategies of our times.

This major reference work for every CogSci researcher is the third and latest of the authoritative MIT series: it has helped to define the field and continues to register new directions and advances in the study of the biologic foundations of complex cognition: it will predictably be the most important reference book for the next decade. According to S. G. Waxman, Gazzaniga has brought some of the world's leading scientists together in "one of the most exciting areas of neuroscience – cognitive neuroscience – and has woven their contributions into a comprehensive and well-documented, yet accessible and provocative, overview" [3].

In brief, this book looks at the mind-brain interface – at the fundamentals of knowledge that have been acquired at all levels of neuroscience – and deftly captures the phases of progress towards identifying the neurobiology of thought, i.e. the relationship between the structural and physiological mechanisms of the nervous system and the psychological reality of the mind. It consists of eleven sections for a total of 1350 pages: Evolution and Development; Plasticity; Sensory Systems; Motor Systems; Attention; Memory; Language; Higher Cognitive Functions; Emotion and Social Neuroscience; Consciousness; Perspectives and New Directions. All major aspects of Cognitive Neurosciences are dealt with, in a dynamic and argumentative perspective; both cutting-edge research and broader theses are included and extensively discussed.

The *Cognitive Neurosciences III* (CN) volume has often

Lucia Abbamonte is with Department of Psychology, Second University of Naples (e-mail: lucia.abbamonte@unina2.it).

Olimpia Matarazzo is with Department of Psychology, Second University of Naples (e-mail: olimpia.matarazzo@unina2.it).

been often cited and commented on by neuroscientists but not by linguists and rhetoricians, even though it is a landmark in the history of science and its style is representative of contemporary research communication, and highly rhetorical at some points. As we shall see, it ranges from self-assured, fairly idiosyncratic statements to explanatory descriptions of methods, data and findings. However, before discussing such linguistic features in detail, it may be significant to illustrate some aspects of the contemporary 'situational' reading context.

II. BACKGROUND: THE CONTEXT OF SCIENTIFIC DISSEMINATION

A. Aspects of Science-Texts and Genre

The relationships between individual texts and general theories of reading, interpreting and analysing are complex, not to say problematic. Establishing a synecdochical link between examples and conceptual generalisations or contexts may be a misleading or biased process [4]: each text is unique to an extent and needs a unique response. However, the tendency to study texts as belonging to genres, and to emphasize their generic, rather than individual characteristics, has been steadily growing from the 1980s onwards especially in the fields of LSP (Language for Special Purposes), ESP (English for Special Purposes) and EAP (English for Academic Purposes). The highly standardized forms of Research Articles, a key genre for scientific communication, have become a major focus for investigation. Thanks to the studies of John Swales [5]-[6], Vic Bathia [7], Maurizio Gotti [8], Ken Hyland [9]-[11], Carolyn Miller [12]-[13], and others, the domain of genre studies is multifaceted and rich in implications for future research.

As concerns scientific books, it is necessary to find a balance between attention to *individual* and *generic* characteristics – the former being more apparent, the more prestigious the volume is. Predictably, famous authors are not particularly worried about conforming to a standard scientific reporting style, and feel free to use a more personal language, especially in the Introductions.

Genre traits, on the other hand, mirror the different expectations of the scientific discourse community they belong to, and rhetorical decisions consequently vary across disciplines, according to the recognized genre purposes.

B. New Reading Habits of Academic Discourse Communities and Emerging Genres

In our case it is relevant to assess the needs and reading habits of the scientific discourse community and the amount of time they spend on average reading for information, and how they 'sub-divide' their time. Currently, Research Articles (RA) rather than books provide specialized information and disciplinary updating for the contemporary, web-wired scientific community, but frequently only the Abstracts and the Results Sections of RAs are read carefully – *Pubmed*, the most widely used database in the medical discourse community provides Abstracts, then full texts can be bought. It is evident that the impact of Electronic Publishing has dramatically changed the reading habits of the academic

community. While it has led to greater uniformity in communicating, it has also brought new and not easily overvalued advantages (i.e. increasingly sophisticated facilities for searching a/for a text, links to other journals and to other related works, 'alerts'), and has simultaneously opened worldwide, viable opportunities to a much greater number of people [14]. Further, thanks to new, innovative tools and indexing systems, 'enhanced abstracts' are now available in many data bases (e.g. *CSA Illustrata*), which provide web-based access to indexed tables, figures, maps and graphs contained in scholarly articles.

The context is multifaceted, to say the least. On the one hand, traditional, prestigious scientific journals and reviews, which are also available on line – thus sharing the same communicative space as the new emerging genres – require that articles intended for submission conform to carefully specified norms for the preparation, arrangement of and citation in the text and reference list: instructions in the style sheets are to be followed carefully – apart from obvious consideration about the quality and standard of their content. Also the shorter Research Letters (RLs), a new emerging medical genre for brief communication about research or experimentation in progress or specific data collected, which are, on the whole, easier to compose, have to follow precise indications, as Maci [15] highlights.

On the other hand, freer and stimulating alternative 'loci' of exchange have recently been introduced, such as the Weblogs – not to mention newsgroups, wikis and peer-to-peer file sharing networks. New, 'fluid' spaces exist that have not failed to attract the interest of genre theorists and scholars in the field of communication, rhetoric and discourse studies [13].

In brief, such are some aspects of the contemporary reading context, where the boundaries between the spreading of information, popular science, and highly specialized scientific dissemination seems to be undermined to an extent by the sharing of the same *cyber* space. What status can a prestigious handbook have in this communicative situation?

C. Scientific Volumes and Accreditation

When re-thinking the role and definition of printed scientific volumes in this 'fluid' but, at the same time, multi-layered context it may be useful to briefly remember the model of the Moscow-Tartu school, which considers culture as a 'collective semiotic mechanism' for the production, circulation, processing, and storage of information, subject to diachronic and socio-geographical variation. Accordingly, the identity, rhetorical modes and status of texts depend on their being functional and meaningful to a specific culture. Ponderous volumes cannot easily be considered as functional in our global, fast-webbed culture, however, as Greg Myers [16] stated about specialised textbooks, it is possible to say that these books are crucial in the life of fact, since they

present a different sort of fact from journal articles, a mosaic of claims from which *the personal and provisional have been removed and in which the pattern of the whole is constructed*. The physicist John Ziman is one of a number of science studies researchers who would see textbooks, along with

encyclopaedia articles and university lectures, as *the conclusion of a process of accreditation* [authors' italics].

The Cognitive Neurosciences III is a case in point. Nowadays the most credited system is the collected writings volume (like *CN*), whose contributors are authoritative researchers – coordinated by one or more prestigious editors – who report the latest (experimental) discoveries in their specialized research territories. A few decades ago, prestigious volumes were not produced as the joint effort of a team of scientists, but by individual, successful scientists whose style was more direct and personal, and somewhat idiosyncratic. The style now tends to be neutral when communicating method, data and results, while in the Introductions negotiating strategies are visibly at work, both when authors situate their work in relation to research tradition, and when they highlight the value of their findings and the implications for the 'advancement of learning' they bring about. By and large it is possible to say that, compared to RAs, the contemporary volumes offer a more self-confident and transitive attitude towards the fast-paced progress of science. To an extent, it is a question of 'hierarchy of genre' as John Swales [6] highlighted when considering the present state of research communities. Among specialized books, the prestigious ones still appear to enjoy a privileged status in our contemporary 'semiosphere', even though they are not as 'handy' as Research Articles – not to say Research Letters – nor so 'interactive' as blogs. The tools of the *rhetoric of science* are particularly useful for the appraisal of the role of linguistic choices in negotiating knowledge claims in scientific volumes.

III. RHETORICAL FEATURES AND THE CONSTRUCTION OF KNOWLEDGE

So far as the status of the *rhetoric of science* as a discipline is concerned, a general agreement on its definition has not been reached as yet. Margaret Hamilton [17] effectively illustrates how the disciplinary boundaries are still being negotiated by pursuing a flexible and dynamic balance between disciplinarity and interdisciplinarity. The use of theories, tools and texts from other similarly related linguistic disciplines has been strongly criticised, and rhetoricians have sometimes happened to distort science through their lack of subject knowledge. Occasional failures or (supposed) theoretical inadequacies notwithstanding, it cannot be denied that *interdisciplinarity* confers strength and inspiration to the rhetoric of science, whose evolution necessarily entails an integrative process between disciplines and their methodologies. Useful insights into the identities and needs of scientific communication are offered in the numerous contributions of Hyland [9]; he highlights how the process of the construction of knowledge as well as texts emerges as the result of social interaction. Academic writing communicates "in a shared professional context [...in a] recognizable social world [...created through] our rhetorical choices [p.36]". In brief, authorial claims for significance have to be balanced against the expectations of the readers, in two main ways:

stance and *engagement*, and the rhetorical decisions adopted vary enormously across disciplines.

IV. RHETORICAL STRATEGIES AT WORK: *THE COGNITIVE NEUROSCIENCES III*

A. *The Status of the Volume*

What makes the *CN* text especially worthy of attention for students of the rhetoric of science is both its unique status in the CogSci discourse community and its intense rhetorical quality, especially apparent in its Introductions. The scientific community considers it as a magnificent accomplishment whose topics range from ions to consciousness, from reflexes to social psychology. In its 94 chapters, structured in 11 sections, Michael Gazzaniga, the editor-in-chief, and his team of 14 co-editors have balanced new discoveries with controversial issues. In the words of Steven Pinker:

It is authoritative and encyclopaedic, but also lively and unafraid of controversy. Michael Gazzaniga, the MIT Press, and the community of cognitive neuroscientists are to be congratulated for assembling this landmark of twentieth-century science and thrilling preview of what we will learn in the twenty-first [cognet.mit.edu/library/erefs].

Further, to quote another among many scientists, Steven E. Hyman

Successful third editions of large reference works must be reliable sources for their field, and Gazzaniga's *The Cognitive Neurosciences* certainly is, authored by a remarkable group of contributors. But this book is far more: it is full of exciting chapters touching on such newly important fields as adult neurogenesis, and it embraces controversy where appropriate. In my view, this already superb text has only gotten better [cognet.mit.edu/library/erefs].

The growth of neuroscience (originally in the singular) in the late XXth century has been impressive, depending both on its combination of technologies and discoveries from other disciplines and on the perspective it provides for understanding some human species-specific attributes of perception, cognition, reasoning and language. In 1995, Gazzaniga's contribution to the rise of Cognitive Neuroscience as a merging of the fundamental aspects of human brain functions and of its behavioural elements was decisive. Cognitive Neuroscience gradually became pluralistic, through a sort of 'metastasis' into the traditional fields of neural development, motor control and sensory perception. The idea behind the ensuing fortunate series of Gazzaniga's *CN* books was to assess the state of the art every five years. The *CN* 2004 edition redefines the idea of comprehensiveness in a reference work and captures a variety of issues in a larger perspective. What the cognitive neuroscientists particularly appreciate in this volume is that it provides the latest in integrative cellular and system work, so as to make it possible to grasp cognitive functions and mechanisms, with enormous implication for rehabilitative medicine. Its rare achievement is to offer mechanistic analysis from gene expression up to cognition. In the words of

Gazzaniga – whose 'licence' in adopting a more personal language is coherent with his scientific prestige – the *CN* “represents the combined efforts” of more than a hundred brain scientists, who worked for the prestigious Massachusetts Institute of Technology on a volume in a series where: “Each volume has served as a benchmark for where the field of cognitive neuroscience stands at each of these *points in time* [authors' italics]” – as we can read in the first paragraph of the Preface, where the beginnings and the developments of this impressive ‘joint venture’ are narrated in a warm and sympathetic way, giving voice to fears, enthusiasms, interest, and explicitly *appraising team work and promoting faith in the fast-paced progress* in the field of CogSci:

All of the talks were structured to include cutting edge research in support of a broader thesis. Yet[...] in the context of an entire section, each talk's individual significance expanded as common themes and discrepancies emerged. Discussion sparked debate and collaborations that spilled out of the conference rooms [...] In this rich environment largely removed from daily rigours and pressures of advancing laboratory progress, many of us rediscovered what initially drew us to the field of cognitive neuroscience[...] began to link seemingly unrelated questions and subdisciplines[...] Each of us left with a greater appreciation of how our individual research fit into a larger picture[...] It is our hope that this book captures this energy, so that all may appreciate this comprehensive and current view of a field that is moving forward at lightening speed [Gazzaniga, 2004: XIII].

The perception of the fast innovations brought about by the researchers' activities in the field, the right timing, and the need and opportunity for change are better illustrated in the light of the Greek notion of *Kairós* as it is interpreted in the context of the development and dissemination of science.

B. *Kairós, Opportunity and the Advancement of Learning*

As Carolyn R. Miller wrote in her seminal essay “*Kairós* in the Rhetoric of Science” [12: 311], “science is often seen as a program for change, the supreme engine of progress [...] *kairós* emphasizes change, or the way one time is different from another”. When Gazzaniga expresses the awareness that the contributors' ‘research fits into a larger picture’ and that the book ‘captures this energy’ within ‘a field that is moving forward at a lightening speed’, his words seem to evoke the very notion of *kairós* as explained by Marramao[18]: the suitable coincidence of the point of time, due time, and of the favourable circumstances for something to happen in a given context – or *spatium*, the complementary notion of *tempus*. The stimulating context of the three-week 2003 Convention of the MIT Institute in CogSci in California (which produced the 2004 *CN* volume) also encouraged informal discussion beyond the scheduled times, during friendly meetings in the California sun. It provided the mixture of different elements that made “the field once again look vibrant, energetic and disciplined. Cognitive neuroscience will be around for a long time [Gazzaniga, 2004: XIII]”. *Chronos* as duration provides the background for the *kairói* or the special opportunities for making innovations and discoveries – such as the June 2003 Cognitive Neurosciences Conference in California – and the

ability to recognize and capture them. Here the notions of time blend with space: *opportunity*, from the Latin *porta* or passage, shares the meaning of ‘aperture’ with *kairós*, as originally used in archery. Furthermore, science promotes change in particular directions, as is apparent in the following excerpts from the volume under analysis, where rhetorical connotation is also noticeable:

- *A few years ago we could state with confidence* that plasticity [...] emerges at multiple levels of the neuroaxis. [...] *In the ensuing half decade, however, a newly recognized* source of plasticity has swept through neuroscience – the genesis of new neurons and glia throughout life. *This discovery has fundamentally altered* our view of brain and mind plasticity. *The present section introduces* this new level of plasticity in the context of traditional analysis [*CN III* p.107 authors' italics].
- *In the last 20 years* the field has been stimulated by the success of functional imaging which infers changes in neural activities from changes in metabolic rate [...]. *However*, when it comes to the question, does energy usage influence how the brain represents and processes information, the *transition from speculation to analysis is a recent event* [*CN III* p.187 authors' italics].
- Attention is a fuzzy concept [...] Since the first edition of this book appeared, there has been *tremendous progress* in exploring the brain mechanism underlying these different functions [*CN III* p.527 authors' italics].
- All of biological science is undergoing a *quiet revolution* [...] neuroinformatics is *beginning* to play a central role in cognitive neuroscience research [*CN III* p.1214 authors' italics].
- Consciousness and the problem of free will reside at the nexus of the mind-body problem. Considerations appear as mysterious to twenty-first century scholars as when humans first started to wonder about their minds several millennia ago. Nevertheless, scientists *today* are better positioned *than ever* to investigate the physical basis of consciousness and volition[*CN III* p.187 authors' italics].
- Over the past decades studies on the primate visual-saccadic system [...] have made significant *progress toward* explaining the neurobiological basis of simple decision making [*CN III* p.1215 authors' italics].

The ‘evolutionary’ *time of science*, interspersed with *kairoitic* opportunities, appears in perpetual motion towards change. Change has been a major focus at least since the XVII century, when Descartes' rationalism and Bacon's empiricism coalesced to give rise to the modern scientific method – particularly so in Bacon's thought that laid a great emphasis on discovery as the engine for change and progress. In an analogous vein, about three centuries later we find the works of Karl Popper [19]-[20] and Thomas Kuhn [21] where change again plays the pivotal role.

In our times the pace of progress and change is ever faster; new knowledge entails new epistemologies, research methods/models and tools, in a kind of spiral process where it

is not always easy to say which is the cause and which is the effect – especially when considering the new, surprising research opportunities provided by technological innovations. As shown in the examples above, in the *CN* Introductions it is often highlighted how the scientists' stance, position and resources for investigation are continually improved and enhanced by revolutionary changes and/or significantly widening perspectives in a field 'that is moving forward at lightening speed' – as the editor-in-chief enthuses, in tones reminiscent of Francis Bacon's optimism about the prospects for fast and valuable scientific progress, to be shared and disseminated for the common good.

C. *Experiential, Physic, Agonistic Metaphors*

Science can usefully be considered as an 'agonistic enterprise' [12: 324], with evolutionary and revolutionary aspects: the difference between innovation and tradition opens up a 'kairotic opportunity for scientific work [12: 324]'. Moreover, it is not only the pivotal genre for 'agonistic' scientific communication – i.e. the experimental/research article – to display what Bazerman [22] views as a conscious exploration of the rhetorical possibilities and of representing scientific research in an argumentative (and persuasive) mode: in scientific volumes the pragmatic/rhetorical value of language is apparent as well.

In *CN* Preface and Introductions, this feeling of opportunity, good timing, human competence and successful performance is suitably conveyed through metaphorical language, whose recurrence in scientific literature has frequently been investigated by both scientists and linguists. The use of metaphors in particular has traditionally been a major focus in considerations about the language of science. In the XVII century the Royal society required a linear, transparent language for the new science that was breaking away from Renaissance religious, cabalistic, alchemic and magical influences. They needed a language as near as possible to mathematical expression, without metaphors, analogy, allegory and other paraphernalia of the Renaissance rhetoric. On the one hand, such orientation has been long lasting and generally approved, on the other, metaphor has survived in the language of science, even if in a less flamboyant manner (e.g., the Darwinian Tree of Life).

A significantly different perspective was provided in the 1950s, and developed into a widely accepted theory. To date, metaphors are no longer considered as obscuring veils and obstacles to comprehension, but, on the contrary, as useful cognitive instruments. In cognitive linguistics, metaphor theory is trying to demonstrate how necessary metaphoric thinking is to our understanding of the world. In Lakoff and Johnson's terms [23]-[24], a scientific theory can attract our intellect only inasmuch as its metaphors mirror our experience: our 'embodied' brain tends to explain the non-physical in terms of physical experience and thus to structure also abstract concepts in terms of sensory experience – metaphors being apparently the more functional linguistic medium. The literature in the field is very rich (to mention but a few researchers, E.F. Keller, R.W. Gibbs and G.J. Steen), and it may not be superfluous at this point to delineate our research 'niche' more specifically: we are dealing with

metaphoric expression rather than with metaphors in science, which is the more common topic. In *CN* we did not expect, nor found extended metaphors nor analogies, such as the description of a cell as a factory, or still, in biochemistry, to use the concept of a *chaperone* protein to describe a protein that prevents unwanted interactions [25].

In our corpus the metaphorical expressions observed are mainly situated in the realms of time perception, of physical (spatial-visual) experience and of 'agonistic' interaction with the tradition, with some inevitable overlapping.

V. METHODOLOGY

From the corpus described below, excerpts were selected to illustrate – in a qualitative perspective – how the authors/researchers of *CN* confidently address CogSci discourse community members from diverse fields, linking 'seemingly unrelated questions and sub-disciplines'; and how persuasively and successfully they attempt to win enthusiastic approval for their innovative and rewarding research – as is apparent in the various reviews of the volume.

The excerpts have been framed according to their dominating rhetorical and metaphorical quality, rather than following fixed pre-existing categorizations, and both White's Appraisal Framework [26], and Ceccarelli's [27] 'adaptive' rhetorical notions have been useful theoretical reference systems.

A. *The Corpus*

The 1350 page volume opens with a general introduction and is divided into 11 sections, each starting with an introduction by its section editor and consisting of 7 or 8 chapters:

PREFACE
EVOLUTION AND DEVELOPMENT
PLASTICITY
SENSORY SYSTEMS
MOTOR SYSTEMS
ATTENTION
MEMORY
LANGUAGE
HIGHER COGNITIVE FUNCTIONS
EMOTION AND SOCIAL NEUROSCIENCE
CONSCIOUSNESS
PERSPECTIVES AND NEW DIRECTIONS

It is in these introductions, and in the general preface – which are the focus of the present analysis – that rhetorical strategies are more visibly at work, rather than in other parts of the volume.

B. *Data Selection*

The qualitative data consist in excerpts where the rhetorical/metaphorical quality of disciplinary expectations surrounding the following notions are apparent: *Knowledge claims/authority asserted; Transitivity; Promoting faith in progress/change* [Table I]; *Negotiating common ground/consensus; Persuasive analogy; Argumentative*

Persuasion [Table II]. In Tables I and II, a sample of data is provided.

VI. CONCLUSION

The common denominator of these excerpts from the *CN* Introductions is the confidence in the value of human agency and in the 'advancement of learning'. The rhetorical strategies displayed convey a self-confident authorial stance, which, far from disguising the personal involvement of the researchers, emphasizes it and aims at effectively connecting the writers to the target science discourse community, engaging the readers as participants in a disciplinary discourse that functions as situated social interaction, finalized to scientific progress. Metaphoric language is often the favourite mode, consisting in both *visual-spatial* and 'agonistic' expression, to better highlight evidence of successful human action. *To claim knowledge* and *negotiate common ground* within the discourse community are recognized textual goals of Introductions, which are achieved here through motivated statements of salience, centrality, specialization of the topics dealt with, and of a general agreement reached thanks to 'largely integrative approaches' to contiguous disciplines. *Persuasive analogy* and the *need for context* represent discourse patterns moving in the same direction: by referring to analogous situations, it is easier to create common ground. A self-confidently positive mood is construed through lexical chains either of emotionally-tinged words, such as 'superb chapters', 'hot aspects', 'harmonized', or of unity-enhancing phrases and lexical chains: 'largely integrative approaches' 'gap ... narrowed ...bridged', 'combination of converging evidence', 'in a similar way', 'by way of illustrating'. The *argumentative persuasion* mode is also synergic with the construal of consensus and mainly develops through a sequence of sentences linked by connectors (*however, nevertheless, although, question form*). Semantic expressions, however, are as important: 'Interestingly', 'I don't question that', 'depending on who', 'striking contradiction', 'correlation'.

Transitivity or the confidence in the capacity of science to transfer its knowledge and actions to its interactants/objects is mainly expressed through emotionally-tinged or physical expressions, such as 'ground breaking observation', 'the implications are enormous', 'a major challenge'. In *Promoting faith in progress* the time notion, which is also recognizable anywhere else, plays a major role. Not only is the diachronic development of science repeatedly taken into consideration, but also the continuity and salience of the *CN* series is here (self)-referred to and used to demonstrate the tangible progress of CogSci, in which the researchers of *CN III* play a pivotal role. Time, when dedicated to research, becomes 'chrono-logical' and merges with cause/effect: 'in the ensuing half-decade', 'over the past decades studies...made significant progress', 'introduces this new level', 'in the last 20 years... transition', 'since the first edition...tremendous progress'.

The faith in the privileged status of the authoritative science volume in the contemporary constellation of genres is evident: "Each volume [of the MIT CogSci series] has served as a benchmark for where the field of cognitive neuroscience stands at each of these points in time", as the editor-in-chief

proudly stated. The publication of the authors' research in such a prestigious volume is the 'conclusion of a process of accreditation' and entails an enthusiastic response from the readers.

In the Introductions of *The Cognitive Neurosciences III*, published in the prestigious CogSci MIT series— 'a volume every CogSci researcher has to read and take into account' – a complex interplay takes place between a heightened perception of the value and transitivity of human intellectual effort, confidence in the effectiveness of the chosen research methods, and the persuasive presentation of the research hypotheses and results. A perception that is not easily found in RAs, nor in other more 'fluid', web-based genres for scientific dissemination. Apparently, the readers' habits to scan Research Articles and Letters or Papers to search quickly for required information are not complied with neither in the *CN*, nor in the MIT series.

The dominating mood in the volume is faith in the 'brave new world' of science, which, thanks to the combined efforts of leading scientists, is promoting the advancement of human knowledge and the ability to improve its conditions. However, there is also room left for the acknowledgement not only of limitations, but also of ethical issues that emerge from a variety of new capacities:

Needed now are *invasive experiments* that can close the gap between correlation and causation. Molecular biology is developing methods for *deliberately, delicately, transiently, and reversibly dissecting individual components of forebrain circuits* in mice and monkeys. The application of such techniques, in combination with simultaneous recording from hundreds and more neurons and functional imaging techniques, will do much to advance towards this goal [X. CONSCIOUSNESS p. 1109 – authors' italics].

Such capacities are 'dense and worrying', as well as the elusive "homunculus, the ghost in the machine that does all the directing of brain traffic [Section XI: *Perspectives and New Directions* 1214]", as Gazzaniga figuratively refers to the still inaccessible areas of the brain's functions. Rhetorical moves and metaphorical expression have been used to shape both scientific progress and its drawbacks and boundaries, thus widening the field of enquiry of this nexus of language-based disciplines, called rhetoric of science.

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TABLE I

SAMPLE OF DATA CONCERNING KNOWLEDGE CLAIMS/AUTHORITY ASSERTED; TRANSITIVITY; PROMOTING FAITH IN PROGRESS/CHANGE

<i>Knowledge claims/ authority asserted</i>	<i>Transitivity</i>	<i>Promoting faith in progress/change</i>
<ul style="list-style-type: none"> students of memory could be forgiven if they felt that their object of study was among the <i>most central</i> - perhaps the most central – in all of CogSci There is perhaps no topic more central to CogSci <i>Converging evidence</i> is the key The usefulness of the classification of aphasic syndromes following As demonstrated by the six superb chapters on emotion[...]the rediscovery of the '<i>hot</i>' aspects of cognition [...] placed research examining the neural basis of emotions at the absolute forefront of CogSci The levels of analysis cover the gamut from cell biology to behaviour Such research methods have yielded an enormous amount of knowledge that can lead The traditional correlation between a clinical <i>picture</i> characterised by [...] has been confirmed by 	<ul style="list-style-type: none"> The implications of this work for rehabilitative medicine are enormous [...] It is rare when we can offer mechanistic analysis of cognition from gene expression up to cognition. In the chapter by Fosella and Posner, this goal is met. Ever since the groundbreaking observation of this region role in learning has constituted a kind of <i>holy ground</i> The increasingly sophisticated and detailed understanding of A major challenge is to understand the link [...]the contributions to this work underscore the remarkable progress A <i>deeper</i> understanding of language evolution is <i>within our grasp</i> One important factor that should be always given appropriate consideration when correlating The question of how action is <i>represented</i> in the brain remains a fundamental problem [...] A major challenge is to understand the link between action knowledge and other cognitive domains 	<ul style="list-style-type: none"> OVER THE PAST DECADES, studies on the primate visual- saccadic system [...] have made significant PROGRESS TOWARDS OVER THE YEARS, we have learned that the physical signals transduced by receptors are very different from the biologically important information in the environment [...] but [...]making accurate inferences from receptor signals is the true challenge of sensory systems. These findings challenge the prevalent view that neuronal activity plays an instructive role in the formation of segregated ocular domains IN THE LAST 20 YEARS the field has been stimulated by the success of functional imaging [...] However [...] THE TRANSITION from speculation to analysis is a recent event. NONETHELESS, there is NOW a clear evidence that the brain needs to be energy efficient The contributions to the third edition of this work underscore the remarkable progress that has been made in understanding the mechanism underlying action ONE OF THE KEY OF PROGRESS in CogSci has been that researcher [...] have all <i>embraced</i> a number of fundamental ideas We expect that research on this topic_WILL CONTINUE to be on the <i>cutting edge</i> of CogSci Tulving concluded his introduction to the memory chapters IN THE SECOND EDITION OF THIS BOOK by observing "These are exciting times in neurocognitive memory research. Happenings at the horizon point to the NEXT 5 YEARS being even more so". He was right, and there is more to come. Stay tuned

N.B. *Spatial-visual* metaphorical expression in italics; '**agonistic**' in bold; TIME, CAUSE/EFFECT in capital letters.

TABLE II

SAMPLE OF DATA CONCERNING: NEGOTIATING COMMON GROUND/CONSENSUS; PERSUASIVE ANALOGY; ARGUMENTATIVE PERSUASION

<i>Negotiating common ground/ consensus</i>	<i>Persuasive analogy / need for context</i>	<i>Argumentative persuasion</i>
<ul style="list-style-type: none"> • Each section editor did a magnificent job • OVER THE COURSE of publishing THREE EDITIONS of this book, we have <i>centered</i> each section on a recognized topic in cognitive neuroscience. The whole idea <i>behind</i> the book was to assess the state of the field EVERY 5 YEARS. Regular publication PROVIDED A TIME TO REFLECT on what we have learned and what we still need to know • There is no disagreement among scientists that human cognitive abilities depend principally on the size and neuronal organization of the cerebral cortex • The study of cognitive functions, and in particular that of [...] has been greatly influenced in the last 20 years by the contribution from neuropsychology • Although many have <i>speculated</i> whether the reductionist approaches of developmental neurobiology could ever be <i>harmonized</i> with the largely integrative approaches of cognitive neuroscience, it now <i>appears</i> as if that time is coming [...] Thus, in this third edition of <i>The Cognitive Neurosciences</i> it appears as though the <i>gap</i> between developmental neurobiology and developmental psychology has sufficiently <i>narrowed</i> that there is little doubt that it will eventually be <i>bridged</i> • So as not to be completely extraneous to the topics in which contemporary researchers in aphasia are interested • Its <i>central</i> position probably depends on • It is for this reason necessary in behavioural research to seek <i>converging evidence</i> from a wide variety • To what extent the traditional aphasic syndromes can be re-interpreted as functional syndromes is matter of debate • Recent reports have, by and large, confirmed • The combination of this technique with electrophysiology has fully confirmed the 	<ul style="list-style-type: none"> • Similarly, those <i>regions</i> should be activated • Similarly, these studies <i>illustrate</i> that the motor systems • This issue can be <i>illustrated</i> with an example from • A possible hypothesis to account for these cases is that they <i>represent</i> instances of[...] for a discussion of [...] see • This fact is interesting as it can perhaps <i>shed some light on</i> the relationship between • Crossed aphasia is in a certain sense <i>specular to</i> • A parallel can be drawn between • An important <i>background for</i> • Considerations of the <i>central</i> role of synaptic plasticity in cognition must now be <i>viewed against the background of ongoing</i> neurogenesis in the brain • This <i>groundbreaking</i> work drives to the core functions of the brain, namely, its decision making faculty. <i>In a similar vein</i> , Shadlen and Gold investigate neurons working to transform sensory signals into motor commands • These experiments [...] have shown how the neural circuitry transforms sensory signals into coordinate frameworks appropriate for movement generation [...] In a similar way, neurobiological studies have also begun to describe the processes by which neuronal activity encodes variables that play an important role in guiding choice behaviour • This prefatory comment is <i>by way of illustrating the daunting task researchers face</i> in trying to <i>uncover</i> the neural basis of language processing 	<ul style="list-style-type: none"> • INTERESTINGLY, the human brain does not differ from the brain of other primates in the number of genes regulating its development. The <i>gap</i>[...] has sufficiently <i>narrowed</i> [...]it will eventually be <i>bridged</i> • HOWEVER , recent work illustrates that certain genes appear to be up-regulated in the human brain[...] THUS, the human brain can be distinguished by changes in the cortical structure • I don't QUESTION that[...] nor do I question [...]NEVERTHELESS • WHY should we be interested in purely psychological studies? It would of course be foolish not to use the new tools from neuroscience. HOWEVER the results of the behavioural task to be combined with brain imaging [...] are CRITICAL to the quality of the information we get [...] Converging evidence is the KEY • Depending on who is speaking • It seems important to begin this chapter on[...] by referring to a construct that has stirred up great controversy • DEPENDING ON WHO is speaking, the investigation of the process of how we think is either the ultimate scientific enquiry or the biggest waste of time ever. • What would we like to know about the human brain? • The fundamental questions of sensory neuroscience, then, are the following • ALTHOUGH the arguments are not unassailable, a reasonably strong case can be made for • We need only think of a striking contradiction present in • Was REPEATEDLY contested • CT studies, while confirming this CORRELATION, have <i>brought to light</i> several interesting exceptions • Although provisional and vague, such a definition [of consciousness] is good enough to get the process started

LONG-STANDING ASSUMPTION [...] I point

out the usefulness of this technique in
animal research and provide examples

- Fortunately, the problems I have
discussed here are not theoretical
limitations but practical ones that can be
overcome as we refine our methods of
investigation

N.B. *Spatial-visual* metaphorical expression in italics; **'agonistic'** in bold; TIME, CAUSE/EFFECT in capital letters.