The Cognitive and Computational Programme in Rhetorical Studies

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In this special issue of *Rhetor* on the relationship between research and Canadian national identity, we find an opportunity to discuss the international efforts in computational rhetoric that connect the University of Waterloo, the University of Calgary, and scholars around the world.

Our project is unashamedly ambitious, bringing the 2.5 millennia rhetorical tradition together with the 0.06 millennium discipline of computer science. Our project promises computational advances, continued cognitive and linguistic advances, and an enriched theory of rhetoric, in a deeply humanistic research tradition, computationally inflected. We reopen the study of rhetorical figures for the 21st century by establishing the cognitive affinities that explain their efficacy and by utilizing computational tools for their study.

Cognitive Affinities and Rhetorical Figures

Rhetorical figures are cognitively governed linguistic devices that serve semiotic, mnemonic, and aesthetic purposes. Take the famous maxim from Kennedy's inaugural address:

Ask not what your country can do for you.

Ask what you can do for your country.

This expression quickly became proverbial in the American consciousness for the way it captures the spirit of a particular historical moment, the ethos of a particular administration, and the aspirations of a particular generation.

Countless formulations, by Kennedy and others, more prosaically expressed that confluence too, but they left a distinctly less memorable impression. Why? Two reasons. Firstly, the formal structure and the functional structure are virtually isomorphic: Kennedy (and speechwriter Ted Sorensen) expressed the rejection of one civic attitude and its replacement by the opposite one, in the iconicity of reversing the terms of reference. Secondly, that very snug form/function coupling inhabits a material structure (antimetabole) that is, on its own, cognitively very sticky. Kennedy and Sorenson were tapping into a rhetorical form that is found in the discourses of science, politics, and folk wisdom, for a start. Here's a smattering of antimetaboles from those domains:

- Women's rights are human rights, and human rights are women's rights. (Clinton 1995)
- Gay rights are human rights, and human rights are gay rights. (Clinton 2013)
- A place for everything, and everything in its place. (Traditional)
- Whether we bring our enemies to justice or bring justice to our enemies, justice will be done. (Bush and Frum)

- Women are changing the universities and the universities are changing women. (Greer)

- You only need two tools in life — WD-40 and duct tape. If it doesn't move and should, use the WD-40. If it shouldn't move and does, use the duct tape. (Stafford)

Antimetabole is rampant, which tells us a lot about language and a lot about the mind—chiefly, the profound importance of cognitive affinities for all facets of communication.

Cognitive linguists have solidly established the fundamental importance of what they call "conceptual metaphor" and "conceptual metonymy." (These are labels we reject, by the way, while still appreciating the phenomena and the research. They are neither metaphors nor metonymies. Rather they are structural reflexes of the same cognitive affinities that manifest as metaphors and metonymies. "My love is a red, red rose" is a metaphor. "I wasted a weekend binging on *Game of Thrones*" is not a metaphor. We prefer *analogic frames* for the former, *correlation frames* for the latter.) But these affinities for similarities and correlations are only two of the several cognitive dispositions that shape our perception, reasoning, memory, and communication. The ABBA structure of antimetabole leverages three other affinities: symmetry, opposition, and repetition.

> *Symmetry*: We respond more favourably to, and recall more easily, symmetrical patterns (symmetrical faces and bodies are judged more attractive than asymmetrical faces and bodies; abstract symmetrical graphics, such as the yin/yang, are recalled more quickly and robustly than asymmetrical graphics). The two cola of the antimetabole are symmetrical with each other (AB and BA mirror each other).
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> *Opposition*: Humans categorize by similarities, of course, which is the affinity underlying metaphor (along with personification, reification, simile, conceit, etc.), but also by opposition, and many base-level concepts are organized in oppositional dyads (up/down, in/out, adult/child). The lexical sequencing in antimetabole is opposite (AB and BA are sequential opposites).

> *Repetition*: At the deepest operational levels of the brain, there are repetitions of neuronal-population firing patterns, reflected at the level of cognition by the importance of repeated stimuli (we repeat phone numbers, addresses, and the like over to ourselves to aid our memory). Antimetaboles have a double repetition (A repeats, B repeats).

Antimetaboles are aesthetically pleasing, memorable, and culturally pervasive because they amalgamate three cognitive affinities.

Other rhetorical figures leverage these affinities (and others) in a range of similar, different, and overlapping ways. Our research establishes the relationship between the figures and the cognitive affinities that drive their rhetorical effects.

Computational Approaches to Rhetorical Figures

In SSHRC-supported research, affiliated with the Centre for Argument Technology at the University of Dundee, the Augmented Criticism Lab at the University of Calgary, and like-minded researchers at other institutions, the University of Waterloo is the centre of an international research program to study rhetorical figures using computational methods.

This picture was taken during the 2016 Computational Rhetoric Workshop at the University of Waterloo. We are, along the bottom, left to right, Ashley Rose Mehlenbacher (Waterloo), Ying Yuan (Soochow University; Soochow, China), Randy Allen Harris (Waterloo), Jelena Mitrović (Universität Passau; Passau, Germany), Marie Dubremetz (Association of Computational Linguistics; Upsala, Sweden), Chrysanne DiMarco (Waterloo); along the top, John Lawrence (Centre for Argument Technology, University of Dundee; Dundee, Scotland), Michael Ullyot (University of Calgary), Cliff O'Reilly (Independent Scholar; London, England), Daniel Devatman Hromada. (Einstein Center Digital Future and Berlin University of the Arts; Berlin, Germany).

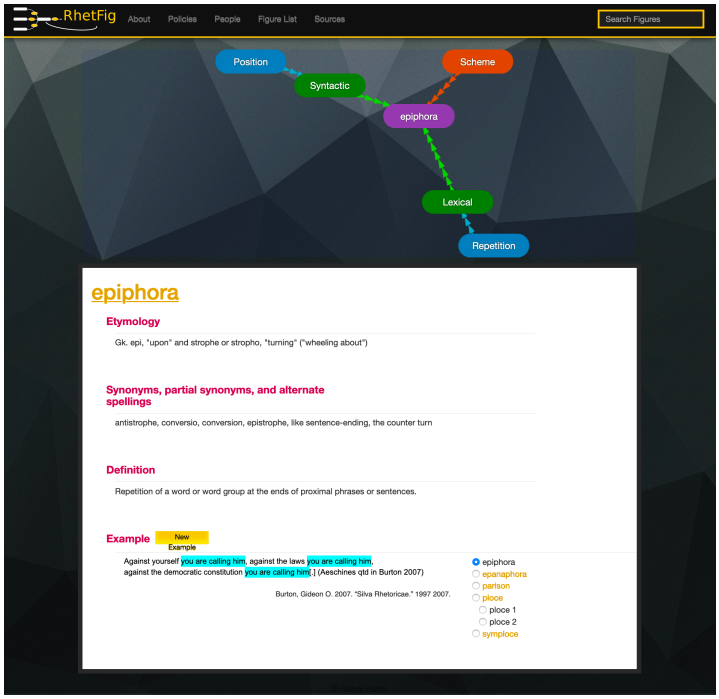
This project has two computational axes, a database of rhetorical figures and an ontology of rhetorical figures. The database lists 1,489 entries (many of them, given the history of figuration, synonymous or overlapping in various ways), created and populated, with copious definitions and examples. We combed millennia of rhetorical theory and pedagogy (especially ancient, early modern, and Enlightenment periods) through digitized public-domain grammars, rhetorics, and composition texts, augmented by contemporary books and websites. The ontology is better structured but only shallowly populated; we call it a mini-ontology at this stage, but it is providing increasing insight into the nature of figuration—especially in the way figures combine. (The Kennedy-Sorenson example, for instance, is not just an antimetabole, but also includes antithesis and mesodiplosis, both of which contribute significantly to its formal and functional properties.) The ontology makes clear distinct combinatoric possibilities of the cognitive

affinities with linguistic elements. (For instance, philosopher Michael Dummett's expression, "What is important is not the existence of mathematical objects, but the objectivity of mathematical statements" is not an antimetabole because of the morphological differences between *objects* and *objectivity*.)

Our current objectives are (1) to build the database into a cleaner, more theoretically principled and more productive tool for both further research and commercial deployment, in direct linguistic terms, and (2) to develop the ontology into a richer, more methodologically consistent and more productive tool both for further research and commercial deployment.

As we move forward, we systematize the definitions and examples of the database, regularizing the terminology. In a two-thousand year tradition, the terms get muddy and confused, and meaning shifts. We control for synonymy (same figure, different names), homonymy (same name, different figures), and other forms of overlap in terminology and definition.

In the next phase, we build a library of computationally tractable representations of the forms of schemes and a library of representations of functions. We are exploring Regular Expressions for the former, Embodied Construction Grammar for the latter, but we have not closed off other possibilities. Building from these representations, we refine, expand, and augment figure detection and annotation tools so that computational methods can be used in the analysis of corpora.



From a prototype of our website, we show a typical page for a rhetorical figure; in this case, epanaphora. It includes the standard information associated with a figure: etymology, definition, alternate terms, and an example. Where it differs is in the ontological graphic at the top, which identifies the linguistic and neurocognitive features of the figure, as well as its traditional taxonomic designation; and in the display of the instance. Since instances of language rarely realize only one figurative pattern, the radio buttons along the right-hand side of the instance allow users to highlight the elements associated with the other figurative patterns present. Please note that, as we go to press, all aspects of this prototype are under further development, including the details of the ontological relations, specificity of the alternate terminology, sourcing data, the ability to display multiple instances, exporting and search capabilities, and information about the form, the function, and the iconicity of the figure.

Implications for Linguistics and Rhetoric

Beyond these gains in computational methods for the analysis of texts, we will make substantive innovations in rhetorical theory and criticism. We will build a rich, encyclopaedic cognitive ontology of rhetorical figures, giving future rhetoricians a critical toolkit for the analysis of scientific articles, advertising campaigns, public address, literature and more.

We will contribute very significantly to the development of Cognitive Linguistics and Construction Grammar through the principled incorporation of formal figures (schemes) into the research agenda of cognitive linguistics (a discipline that has not yet drawn from the well of rhetorical theory and criticism).

This research program is inter-institutional and international, but its heart is a twenty-year research program begun at the University of Waterloo. A bibliography follows.

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