Guest Editorial

At the Margins of Cybernetics

This special issue of the *Canadian Journal of Communication* (*CJC*) explores some of the connections between cybernetics and diverse fields of study: communication studies, media theory, philosophy, agriculture, and architecture. When putting it together, we intended to explore how the heritage of cybernetics has been put to work following the field's relative decline. The term "cybernetics" generally refers to an interdisciplinary science that federated a diverse number of scholars around computing and systems theory in the late 1940s. Following the Second World War, and in reaction to major technological innovations in data processing, scholars from a broad spectrum of backgrounds (psychiatry, neuroscience, mathematics, electronical engineering, biology, economy, and anthropology) joined forces in the hope of advancing knowledge about information and communication systems, whether mechanical, cognitive, or cultural.

Cybernetics gained most of its visibility during the Macy Conferences, held in New York City, New York, and Princeton, New Jersey, from 1946 to 1953. It also became globally popular in part thanks to the favourable reception of Norbert Wiener's (1961) publication *Cybernetics, or Control and Communication in the Animal and the Machine* in 1948. It was in that book that Wiener famously explained how the name "cybernetics" was decided upon. For more than a decade after 1946, the project of cybernetics attracted unprecedented worldwide interest and led to several crucial technological and intellectual developments. By the late 1950s, however, enthusiasm for the general science of cybernetics fizzled out in both North America and Europe, most notably in France where it had gained a solid notoriety (Breton, 1984; Le Roux, 2009). Even though it had been a mainstream science for a brief period, cybernetics was pushed to the margins.

Despite this less than favourable context, some scholars who had engaged with cybernetics continued to put its concepts to work, and recursively applied cybernetics principles to cybernetics itself. Their work, beginning in the 1970s, was labelled "second-order cybernetics" (Clarke & Hansen, 2009). Similar to those scholars who continued to apply cybernetics principles, we continue to believe that this field has value to communication studies. Thus the initial argument for this special issue was that even beyond the second generation of cyberneticists, the legacy of cybernetics was far-reaching. As such, we were interested in how cybernetic concepts, metaphors, and media largely transcended the boundaries of the initial project and were mobilized in a plurality of fields of study, theories, discourses, and artistic practices with a relationship to cybernetics that often remains implicit. How were these ideas, discourses, and theories exported, adapted, or even distorted over time by others? In particular, and

of special interest to *CJC* readers, we invited contributors to give special treatment to the connections between cybernetics and communication studies while exploring some of the minor, forgotten, discarded, or experimental intellectual or artistic projects that developed on the margins of cybernetics.

By locating ourselves at the "margins of cybernetics," we meant to explore that interstitial space where the theories, concepts, and methodologies of cybernetics met other disciplines and practices. As John Durham Peters (2011) noted, "marginality can be intellectually creative, [it] afford[s] outlooks not available at the center, and install[s] at least two virtues: humility and hospitality" (p. 1467). Of course, our invitation to contributors to reflect on the margins of cybernetics was pleonastic to begin with: the discourse of marginality has long been prevalent in historiographies of cybernetics. As we have noted, cybernetics developed at unexpected, singular contact points on the map of sciences—mathematics and physiology, electronics and neurology, ballistics and metaphysics—and remained voluntarily marginal. Even cyberneticists themselves upheld such marginal positions, what Norbert Wiener (1961) called the "boundary regions" (p. 2). As he famously explained, cybernetics originated in a series of dinners held at Harvard Medical School's Vanderbilt Hall, where an informal group gathered around him and Arturo Rosenblueth to discuss scientific methods. Wiener (1961) and Rosenblueth were then convinced that "the most fruitful areas for the growth of the sciences were those which had been neglected as a no-man's land between the various established fields. … It is these boundary regions of science which offer the richest opportunities to the qualified investigators" (p. 2). If the core epistemology of cybernetics was a decentring one, then cybernetics is probably only at home in the margins.

Exploring the margins of something so profoundly marginal as cybernetics was both a challenge and a provocation for the authors who responded to our invitation. It was a productive challenge, because the margins came to mean different things for different authors. For some, the exploration of the margins meant bringing light, syntagmatically, to certain facets of cybernetics that have been neglected (**Sheryl N. Hamilton**), or to some of the intellectual movements overshadowed by the momentous visibility of cybernetics (**Ghislain Thibault** and **Mark Hayward**). For others who approached the issue paradigmatically, the margins constituted a space where a common set of ideas was meeting, emerging, telescoping, or transmuting. Whether these ideas shared by both cybernetics and other fields of research emerged independently (**John Bonnett**) or were direct loans (**Jan Müggenburg**), their commonality speaks of changing epistemic moments. Finally, three authors explore the importation, adaptation, and distortion of cybernetic metaphors, models, and concepts by other disciplines. In the cases explored here, the marginal nature of these loans, whether in architecture (**Marion Roussel**) or agriculture (**David Russell** and **Ray Ison**), was at odds with the established canons of strong disciplinary fields.

In all the articles included in this special issue, exploring the margins of cybernetics was also a provocation, since our goal was not to reify the margins as a site that is methodologically or ontologically more significant than the centre. Rather, the objective was to offer the possibility to think of the margins themselves both as an oppor-

tunity and a problem, and we thank the contributors for showing how mobile both centres and peripheries can be.

Cybernetics and communication

Why should we explore, today, the margins of cybernetics in a journal dedicated to communication? To answer the first part of the question, one might look at the current revival of interest in cybernetics, historiographical or otherwise. In recent years, there has been an increasing number of scholarly works engaging in the histories of cybernetics. Consider, for instance, works in the history of science, such as Andrew Pickering's (2010), *The Cybernetic Brain*, Orit Halpern's (2015), *Beautiful Data* , or Ronald R. Kline's (2015), *The Cybernetics Moment: Or Why We Call Our Age the Information Age* (2015). Most historians agree that a unique historiographical account of cybernetics is not possible. As Pickering (2010) puts it, "one can almost say that everyone can have their own history of cybernetics" (p. 3). The heterogeneity of cybernetics, and the uncertainty about its boundaries, is reflected in the diversity of its historiographies. Recent publications have focused on the history of Soviet cybernetics (Gerovitch, 2004; Peters, 2016), German cybernetics (Bissell, 2011; Dittmann, 1999), Chilean cybernetics (Medina, 2011; Saraiva, 2012), or diverse African influences in cybernetics (Bangura, 2012; Eglash, 1995; Eglash & Bleecker, 2010). Other work in cybernetics and disability studies, postcolonial cybernetics, cybernetics studies in the Global South, and critical gender studies all testify to how stimulating cybernetics can be from a wide variety of perspectives (Dyer-Witheford, 2015; Haraway, 1987; Hayles, 1999; Mills, 2011; Paasonen, 2002; Plant, 1995; Schaffer, 1996).

At the same time, and equally serving as a testimonial of this renewed interest in cybernetics, several primary sources have become available to scholars. Notable examples include Claus Pias' (2016) edition of the proceedings of the Macy Conferences, published in 2016, as well as the first French translation of Norbert Wiener's *Cybernetics* in 2014. This persistent scholarly fascination with cybernetics may be read as an indication that the questions cybernetics posed have been left unanswered.

The renewed interest in cybernetics is more than historiographical: it is symptomatic of an unresolved set of questions regarding how we perceive and practice interdisciplinarity on the one hand, and how we address the difficult mediation between biological systems and technological ones on the other. It is as if, despite the decline of everything "cyber," beginning with cybernetics itself, certain fundamental questions associated with those issues have simply lingered. For example, a number of the deep ethical, anthropological, and cultural questions that accompanied the rise of advanced technology have remained unanswered. In some cases, their relevance has even intensified. Arguably the modernization of the terminology we use has not exhausted the horizon opened by cybernetics in the 1940s.

To answer the second part of the question, why explore cybernetics in a communication studies journal, we might indeed ask: What is the debt, if any, of communication and media studies to cybernetics? Most histories of the discipline of communication studies do not make a clear genealogical connection between the rise of cybernetics and the institutionalization of communication studies in the 1940s. Cybernetics was undertaken in various disciplines. However, while communication studies would be-

come one of the new power brokers of academia, cybernetics was never widely institutionalized. The academic field known as "communication studies" was equally interdisciplinary, yet in many cases it was not a direct outgrowth of cybernetics. Many communication scholars knew of cybernetics, although their interest in it seems to have been secondary. Robert Babe's (2000) *Canadian Communication Thought*, for instance, is silent about the debt that the pioneers of communication studies in Canada may have had to cybernetics. Conversely, cybernetics was instrumental in promoting scholarship in relation to and about the concept and idea of "communication." As Peters (2011) explains, from the postwar period up until the late 1960s, numerous academic fields were affected by a new fascination with communication, inspired in part by the interdisciplinary project of cybernetics. The successful institutionalization of communication studies among social sciences and humanities during the second half of the twentieth century is in part indebted to the thematic importance given to communication, and cybernetics was responsible. Even if there was no long-lasting and clearly established disciplinary cohabitation between cybernetics and communication studies, the two were, for a moment, intimately entangled. Along with psychiatry, cybernetics was a "key nodal point" (Peters, 2008, p. 143) for understanding communication during that period. In many communication departments, systems theory is taught as one of the foundational theories of the field. Cybernetics and media and communication studies also share a number of features that the contributors to this special issue tangentially address: their visibility as sciences (**Hamilton**), their interdisciplinary nature (**Roussel**), their interest in processes more than objects (**Bonnett**; **Russell** and **Ison**), and their concern for technological materialities (**Thibault** and **Hayward**; **Müggenburg**). The contributors, as we detail in the next section, found their own ways of engaging with the theme of margins and cybernetics.

Overview of the contributions

Sheryl N. Hamilton's article "The Charismatic Cultural Life of Cybernetics: Reading Norbert Wiener as Visible Scientist," analyzes the relationship between Norbert Wiener and the construction of cybernetics as a "charismatic science." Using visible science scholarship, Hamilton argues that the prominence of famous scientists, such as Wiener, in turn provided visibility for their field of research. Working at the intersection between cultural studies and the history of science, Hamilton provides points of entry to understanding the cultural context as one of the conditions of cybernetics' emergence, and thus a key analytical factor for the emergence of both visible scientists and visible sciences. Her work engages with primary data, mainly from 1950s popular press material, to illustrate the four symbolic roles of Norbert Wiener's visibility. While these are specific to Wiener, Hamilton's theoretical work could well be transposed to other historical figures. This article also adds to cybernetics scholarship, as it examines the cultural significance of cybernetics through the lens of the media. Wiener's public persona was one of the ways cybernetics achieved mainstream public attention. Hamilton shows that it took a prophet for the new science to gain the public's heart; this is the core of the "charismatic" aspect of scientific activity in her argument. She also shows that Wiener's fame was uneasily regarded by his academic peers. The more Wiener became a public intellectual, easily identifiable by his physical appearance, the more

he was in fact pushed to the margins of his disciplinary core, mathematics. As Hamilton illustrates, Wiener was aware of this, and he struggled to define what role mathematics should play in his life once he had achieved public fame. Hamilton's article will appeal to historians of science and communication scholars alike, as she offers a new model for understanding the popular reception of scientific activity through the interaction of a "visible scientist" with the media.

In "The Flux of Communication: Innis, Wiener, and the Perils of Positive Feedback," **John Bonnett** argues that the margins are a space where common ideas can emerge independently. Bonnett proposes a comparative analysis of Norbert Wiener's concept of positive feedback and Harold Innis' application of increasing returns, a concept from economics. He suggests that the two terms refer to the same dynamic process—cumulative change—and that the two men were invested in learning how that process stabilized and destabilized the systems that concerned them: biological and mechanical for Wiener, economical and civilizational for Innis. Bonnett proposes a close rereading of some of Innis' earliest writings on communication and argues that they show remarkable parallels with Wiener's writings on cybernetics, even though both men worked independently during the 1940s. Through his demonstration of Innis' commitment to feedback-like concepts, Bonnett expands our understanding of the conceptual and historical origins of communication theory in Canada. In particular, while Innis' legacy has mostly been framed around the notion of bias, this article invites us to consider Innis' description of a second, mirroring consequent of communication technology, which Bonnett coins as "the flux of communication." Innis, Bonnett writes, believed that flux was one possible, and very dangerous, outcome of the dynamics of information flow. He acquired his interest in information and its cyclical dynamics as a result of studying the rise of business cycles. Historiographically, it should be noted, this is a concern Innis shared with other historians of human civilization, such as Jacob Burckhardt or Arnold Toynbee. Notably, and especially illuminating for the current information age, Bonnett shows that Innis' concern with "flux" was tied to the collective and irrational effects of information overload, showing once more the pertinence of his work for the social sciences. Overall, while Bonnett's article will appeal to Innisian scholars, it also illustrates how cybernetics and early communication studies did not cross-fertilize explicitly, at least not in Canada. Rather, they evolved independently while sharing similar concerns, which they evoked and addressed with different terms. This conceptual rapprochement helps us to understand the conditions of existence for first- and second-order cybernetics, and illuminates a particular epistemic moment, that of North American mid-twentieth-century thought.

Ghislain Thibault and **Mark Hayward'**s article "Understanding Machines: A History of Canadian Mechanology" investigates the little-known history of mechanology and focuses on its two Canadian promoters, computer science professor John Hart and essayist Jean Le Moyne. Building on primary sources, including the private papers of Jean Le Moyne, Claude Hurtubise, and André Belleau, the article chronicles two decades of efforts to carry out Jacques Lafitte's 1932 original plan for a new science of machines called "mechanology." Despite several successes, including the creation of

the Mechanology Centre in Zurich, Ontario, and the organization of a major international colloquium at the Canadian Cultural Centre in Paris in 1971, mechanology attracted little attention in Canada and remains on the margins of the country's intellectual history. In order to situate Canadian mechanology, Thibault and Hayward describe its intellectual lineages and ramifications. The article comparatively analyzes the marginality of mechanology and relative centrality of American cybernetics and Canadian media theory. Thibault and Hayward expose how Hart and Le Moyne, who both worked in the 1960s and were aware of Wiener's science, positioned mechanology as an alternative to cybernetics. According to the authors, Hart and Le Moyne's reluctance to identify with cybernetics is best explained by the deep philosophical divergences between cybernetics and mechanology. Explaining these differences, one of the article's important contributions is to assess the originality and specificity of mechanology. Thibault and Hayward show that Canadian mechanologists were paradoxically more faithful to mechanology than their French predecessors, who engaged freely with the cybernetics canon. They also illuminate how Canadian mechanology developed in the shadow of Canadian communication thought. In particular, the article shows that despite Hart and Le Moyne's interpersonal networks overlapping with those of Canadian communications theorist Marshall McLuhan, the Canadian mechanologists did not identify with the Toronto School's media theory. In a way, Thibault and Hayward explore yet another meaning of the margin, not as a spatial concept but a mathematical one: their analysis of mechanology locates the narrow margin of error—in this case, a not-so-felicitous choice to privilege "machine" over "media"—which sometimes separates disciplinary canons from the margins.

Jan Müggenburg's "Bats in the Belfry: On the Relationship of Cybernetics and German Media Theory" fills a gap in the history of transatlantic (U.S.–German) media theory. It offers an enlightening examination of some the noticeable commonalities shared by German media theory and cybernetics by providing a genealogy of the circulation of some key concepts within both traditions and, more crucially, of the epistemological ways the two social sciences were situated. At the centre of this inquiry is the complicated yet fascinating relationship between the works of Warren S. McCulloch and Friedrich A. Kittler. Even as he locates some of the debt of German media theory to cybernetics, Müggenburg recognizes the specificities of each research tradition and stresses the "fundamental antagonisms" that remain between them. Working through what he describes as a heuristic "thought experiment," Müggenburg seeks to identify how paradigms can act as a "function" of others. He goes on to show how McCulloch's epistemological endeavours interface with Kittler's media (or technological) concerns. He identifies lines of sympathy between those two paradigms by presenting empirical data and mobilizing historical documents. As German media theory gains more attention in scholarship globally, the article provides insight into thinking about it in relation to other paradigms. Indeed, the historical account here ultimately sheds light on the "rediscovery" of cybernetics in the 1990s (after it gradually withered in the 1970s) in relation to the simultaneous rise of German media theory. Müggenburg calls for further examination of the ways those two epistemological paradigms are currently gaining traction in the social sciences.

In their contribution, titled "Fruits of Gregory Bateson's Epistemological Crisis: Embodied Mind-Making and Interactive Experience in Research and Professional Praxis," **David Russell** and **Ray Ison** offer some insights into the challenge of implementing research informed by second-order cybernetics. The authors look back on thirty years of collaborative research, which they pursued in rural research and development as well as therapeutic praxis. Borrowing from the work of Gregory Bateson and Humberto Maturana, they show both the potential and the difficulty of applying a cybernetic framework in order to foster change in the relationship between actors and their environment (be it grazing animals in western New South Wales, Australia, or a patient in the context of a specific therapy). The challenge in each case lies with the effort to move from a conceptualization of communication as one that enacts a pre-established set of objectives to one that is an open system of exchange. In the latter, organization emerges from interactions between researchers and participants, instead of resulting from top-down control. Using this approach, the authors take a position in one of communication studies' most characteristic debates: the epistemological shift of understanding communication as a *process* rather than a *product*. As Russell and Ison observe, the importance of "the recursive nature of a circulating system" has been acknowledged in communication studies since at least the middle of the twentieth century (although not explicitly mobilized; organizational models examining the constitutive role of communication in organizations provide one example of such attempts). Hence, readers familiar with communication studies will find here a window into the challenge of using a framework borrowed from second-order cybernetics to solve real-world problems. Along with discussing the motivations for this shift (at once both epistemological and practical), Russell and Ison include an Appendix table in the article presenting a four-stage strategy for implementing research and development inspired by second-order cybernetics. Each stage is defined by a specific task, how it relates to first- or second-order processes, the skills involved that all parties must use, the problems encountered, and finally the authors' own critical reflections.

Finally, in her article, titled "De la cybernétique à l'architecture numérique. Retour sur un demi-siècle de théories, pratiques et projets expérimentaux," **Marion Roussel** provides a historical review of the conceptual entanglements of cybernetics and architecture. She points to key moments since the 1960s when the theory and practice of architecture have been influenced by cybernetic approaches and examines this relationship in light of communication scholarship. Roussel also addresses more recent technological developments, such as virtual reality, biotechnology, and smart cities, extending the focus of her article to contemporary issues. Roussel's main contribution is to highlight the connections between fields and the complex transnational flow of ideas that shaped what may be called "cybernetic architecture." Surveying the history of cybernetic architecture, she considers the question of the margins from a spatial and temporal point of view. Cybernetic architecture first developed at two main centres: the Centre for Land Use and Built Form Studies, which was founded at Cambridge University in 1967, and the Architecture Machine Group, which was founded at the Massachusetts Institute of Technology in 1969. In the 1960s and 1970s, these centres attracted leading figures such as cyberneticist Gordon Pask and architect Cedric Price—

the latter of whom theorized a form of cybernetic architecture concerned with interactivity and adaptability. A little later, another stream of cybernetic architecture was developed in connection to Humberto Maturana and Francisco Varela's second-order cybernetics. This stream was characterized by a new focus on "auto-organization" and "auto-poiesïs" and was first developed by a group of Japanese architects called the Metabolists. Their then-marginal preoccupation with the hybridization of the biological and technological soon conquered Western "radical" architecture, including the Viennese architects of Haus-Rucker-Co and Coop Himmelb(l)au. This article will be of interest to media historians as it explores media technologies that developed at the intersection of cybernetics and architecture, including early immersive technologies, such as Walter Pichler's TV-Helmet in 1967 and Haus-Rucker-Co's *Mind Expander I* in 1967. While these media technologies are now forgotten, Roussel's essay points to the profound effect of new media on architectural practices and theory. These transformations not only shaped architectural practices but our very own living environment, the most mainstream media of all.

This special issue of *CJC* has been an opportunity for us to begin to weave together a common genealogy of cybernetics and communication studies. Of course, a single issue with six contributions certainly could not pretend to offer an in-depth overview of all things cybernetically marginal or marginally cybernetic. We hope to show, however, that cybernetics has remained active and visible in a range of voices, and that this special issue can add a few more building blocks to expanding our knowledge about the legacy of cybernetics. We thank Michael Dorland, the editor of *CJC*, and the contributors for joining with us in such an exploration.

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