

The Flux of Communication: Innis, Wiener, and the Perils of Positive Feedback

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ABSTRACT

Background In the early 1940s, two men from different disciplinary contexts converged on three concerns: information, its dynamics, and the pathologies stemming from those dynamics. Norbert Wiener studied these concerns from the context of mechanical and biological systems. Harold Innis viewed them from the perspective of political, social, and cultural systems.

Analysis The purpose of this study is to establish this commonality, and consider its implications for two histories, those of the Cybernetic and Toronto Schools of Communication.

Conclusion and implications For the Cybernetic School, the similarity suggests that the intellectual roots behind it are more extensive than scholars have appreciated. For the Toronto School, this study suggests that the concepts of information, increasing returns, and the flux of communication are neglected constituents of Innis' thought.

Keywords Harold Innis; Norbert Wiener; Cybernetics; Toronto School; Positive feedback; Increasing returns; Media; Information

RÉSUMÉ

Contexte Au début des années 40, deux hommes de disciplines différentes ont convergé sur trois questions : l'information, les dynamiques de celle-ci, et les pathologies résultant de ces dynamiques. Norbert Wiener étudia ces questions en privilégiant les systèmes mécaniques et biologiques. Harold Innis quant à lui les étudia en privilégiant les systèmes politiques, sociaux et culturels.

Analyse Cette étude a pour but de souligner la convergence entre ces deux auteurs et de considérer les implications de celle-ci pour deux histoires, celle de l'école de communication de Toronto et celle de la cybernétique.

Conclusion et implications Pour l'école de la cybernétique, cette convergence semble indiquer que les fondements intellectuels de cette école de pensée sont plus vastes qu'on l'a cru jusqu'à présent. Pour l'école de Toronto, cette étude suggère que des concepts comme l'information, les rendements croissants et le flux de la communication sont des composantes de la pensée d'Innis qui ont été négligées jusqu'à présent.

Mots clés Harold Innis; Norbert Wiener; Cybernétique; École de Toronto; Réaction positive; Rendements croissants; Médias; Information

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Introduction

In the early 1940s, two very different men, in two very different locales, initiated research programs that would take each one to a very similar place. The first man was the Massachusetts Institute of Technology (MIT) mathematician Norbert Wiener. Prompted by insights he had obtained in a project dedicated to creating a self-guiding anti-aircraft battery, Wiener, in collaboration with Arturo Rosenblueth and Julian Bigelow (Wiener, Rosenblueth, & Bigelow, 1943), initiated a course of comparative study tracing the impact of control and communication mechanisms on the behaviour of mechanical and biological systems. The second man was a political economist based at the University of Toronto: Harold Innis. Prompted by insights he had obtained from the history of Canada's pulp and paper industries and the onset of World War II, Innis embarked on a course of study that linked transformations in communication technology with the evolution of the political, social, and cultural systems that concerned him (Bonnett, 2013, 127–128).

Remarkably, despite working in very different disciplinary and theoretical contexts, both Innis and Wiener would rapidly and independently converge on a common set of concerns: the concept of information, its dynamics, and the pathologies that emerged as a result of those dynamics. Each worked on the margin of the other, and yet each believed that the dynamics of communication potentially imposed two consequents on systems. The first condition was stasis, a state Wiener referred to as equilibrium and Innis referred to as bias. By contrast, communication flows could also take systems to a state of unstable oscillation and ultimate collapse, a condition referred to here as the “flux of communication.” The purpose of this contribution is to establish this commonality. It is also to suggest that this case study in marginality—neither scholar knew of the work of his counterpart during the 1940s—has important things to say to communication scholars and intellectual historians interested in the respective histories of the cybernetic and Toronto School of Communication.

Positive feedback and its dangerous consequents: Norbert Wiener's cybernetics

A re-visitation of key ideas expressed in Norbert Wiener's various writings on cybernetics is a fitting place to begin. Wiener's writings on the dynamics of information flow are much travelled and have been much discussed by interpreters, but still form an essential point of departure for this discussion. The chief insight that Wiener, singly and in conjunction with others, offered in his cybernetic writings is that certain classes of mechanical systems behave in a manner analogous to organic systems. The reason for the commonality, he argued, was that both types of system share a common need: the need to exchange information with the surrounding environment in order to engage in purposive behaviour. The outcome of that exchange is a circular flow of information that unites the agent with its environment. This interaction produces one of two effects. The interaction will either reinforce, or regulate and dampen, the initial act of the agent.

Wiener, borrowing a term from engineering, referred to the latter process as negative feedback. In scenarios governed by negative feedback, the environment reacts in a way that induces the agent to modify or cease its initial act in order to realize its

initial purpose. The environment transmits information that informs the agent of its progress in fulfilling its purpose. It does nothing to hinder the agent in completing its purpose. The simple act of steering is the classic example of negative feedback in action. As an agent steers a vehicle, be it a ship or car, the environment provides negative feedback, in the form of information on the vehicle's progress. That information induces the agent to progressively reduce the degree of turn of the rudder or wheel as the vehicle works to complete the turn. Negative feedback enables individuals to maintain control, both over themselves and their environment (Rosenblueth, Wiener, & Garcia Ramos, 1985, pp. 488–490; Wiener, 1948). It further enables those same individuals to exist in equilibrium with their environment. Any living agent, Wiener (1985c) argued, needs to enter into a state of homeostasis—"the maintenance of some sort of dynamic equilibrium" (p. 773)—to survive in his or her surroundings. Humans, for example, need to maintain a mean temperature of 98.6° F to perform optimally. If body temperature fluctuates a degree or more in either direction, they become sick. If that figure shifts by ten or more degrees, they die. To prevent that eventuality, the body is replete with mechanisms that regulate temperature, the flow of oxygen and carbon dioxide, and salt levels in the blood: "These mechanisms constitute what is known as homeostasis, and are negative feedback mechanisms ..." (Wiener, 1950, pp. 95–96). The purpose of negative feedback, then, was to foster systemic unity between the agent and its environment, to afford mechanisms for control, and to maintain a state of equilibrium between the agent and its surrounds.

Wiener referred to the second outcome of agent-environment interaction as positive feedback. Here, the agent acts and the environment reacts in a way that supports the initial action. A self-sustaining process of action and supportive re-action emerges. The classic example of positive feedback is the unintentional amplification of sound produced by microphones and speakers. An individual at a wedding, for example, steps up to a microphone to make a speech, and as he or she speaks, the speakers amplify the communicant's words. Unfortunately, due to the speaker's proximity to the microphone, he or she produces output that is inputted to the microphone in addition to the individual's voice. A self-sustaining process emerges. Positive feedback reinforces a process of amplification that causes the speakers to produce sound that is progressively louder, shriller, and more unpleasant, until someone turns off or covers the microphone (Rosenblueth, Wiener, & Bigelow, 1943; Wiener, 1950).

For Wiener, the force of these insights was that they suggested mechanical and organic systems were at base similar, and that the pathologies afflicting them might share a common cause. He began this line of reasoning by noting that the most effective control devices were in some sense autonomous, insofar as they were governed by negative feedback and automatically altered their own behaviour in reaction to environmental stimuli. He also noted, however, that the same devices were susceptible to catastrophic failure. "This negative feedback," Wiener (1985b) noted wryly in 1954, "has its diseases" (p. 794). Wiener argued that there was an upper threshold in the quantity of incoming information that any control device could accept. If the device traversed that threshold, the process governing its behaviour shifted from negative feedback to positive feedback. Systems such as anti-aircraft batteries and robots lost their capacity to dampen the tra-

jectory of their actions, and instead became locked into a recurring pattern of clumsy behaviour: “When the limits are exceeded, the system becomes definitely unstable and goes into oscillations with an amplitude increasing up to the point where the system breaks down ...” (Rosenblueth et al., 1985, p. 490).

For many in the 1950s, Wiener’s arguments proved persuasive, in large measure because he and his colleagues demonstrated the existence of a similar pathology in humans, namely purpose tremor. There seemed every reason to believe Wiener’s claim that mechanical and biological systems could each serve as analogues to better understand the structure, functioning, and malfunctioning of their counterpart. Wiener certainly hoped so. He even believed it might shed light on pathologies such as mental disorders. Noting the structural similarities between telephone networks, consisting of chains of relays, and the human brain, consisting of chains of neurons, Wiener argued that telephone networks were robust in their capacity to support ever-increasing quantities of information. Until, that is, they reached a certain threshold, and then the entire network broke down. Could it be possible, Wiener (1985a) asked, that humans might fail in the same way? That humans, with “the largest chain of effectively operated neurones [sic]” of all animals, might be capable of performing complex acts until they reached “the edge of an overload,” and “give way in a catastrophic manner, “having “a form of mental breakdown, very possibly amounting to insanity” (p. 788).

Finding correlates between Wiener and Innis:

The three properties of Harold Innis’ writing

Harold Innis certainly thought so. But that is no surprise since each of Wiener’s concepts—negative and positive feedback, and the pathologies stemming from circulating information—have their correlates in *Political Economy in the Modern State*, the first anthology of four he wrote dedicated to the then nascent field of communication (Innis, 1946).¹ How might these correlates be found? One might begin by taking note of three properties that distinguish *Political Economy in the Modern State* and Innis’ writings more generally. To start, *Political Economy* in its preface and first seven articles constitutes a history of the West, one that extends from ancient Rome to Innis’ present. Second, note that Innis framed this history in a binary. The significance of this binary is that it upsets the traditional view of Innis, suggesting that there is more at play in his philosophy of history than has traditionally been understood. In the third article of *Political Economy*, Innis (1946c) writes:

Machine industry through printing press dispenses with thought or compels it to move in certain channels. The dispersion of thought through the printing industry makes attack on monopoly increasingly difficult. In emphasizing a long-range approach to social phenomena, economic history should contribute to stability. Not only should it supplement political and social history, it should in supplementing them check the tendency in itself and in them to bias and fanaticism. (p. 100)

In the first and last sentence of this passage, Innis (1946c) argues that communication technologies historically have imposed two equal and opposite consequents on their users. The first, of course, is bias. Scholars have long known of Innis’ preoccupation

with technologies that compel thought “to move in certain channels” (p. 100). The second consequent is harder to identify because Innis does not explicitly name it, and its effects are variously described here. On the one hand, in contrast to bias, this consequent does not freeze thought. Instead, it dispenses with it. On the other, it also seems to support the rise of fanaticism.

Despite Innis’ failure to explicitly identify this second consequent, it is possible here to argue for its existence in his thought and writing and, for the purpose of this article, to also name it: the flux of communication. Such a presumption is possible because of a third property in Innis’ writing: his well-known penchant for incorporating constructs into his narratives without explicit identification. Ian Parker (1981), one of Innis’ more astute interpreters, writes that Innis’ works are grounded in the detailed historical study of “particular systems ...”.

As a result, notwithstanding some passages that appear to summarize aspects of his theoretical position, most of his analytical framework is *only* available in *implicit* form and can only be extracted and rendered *explicit* through an extended inductive process involving a period of intensive absorption in his work. (p. 129)

Through such an inductive process—one that appeals both to Innis’ economic and communication writings—it is possible to establish his adherence to the hypothetical second consequent, the flux of communication, and to show that it is markedly similar to the pathologies that Wiener identified in his writings on cybernetics. When the flux of communication is shown to be at play in Innis’ narrative, the reader should also see instances where thought, at the individual and socio-cultural level, loses its stability, and begins oscillating from one position to another. He or she should also see instances in which the constructs of individual or social thought completely lose their coherence, disperse their constituents, and in so doing mimic the systemic collapse described by Wiener. Finally, our survey should also show Innis’ belief that the cognitive impact of technology—be it bias, the monopoly of knowledge, or flux—is the outcome of a dynamic of information flow that precisely matches Wiener’s concept of positive feedback. This inductive process will begin first by examining Innis’ writings on the concept of information. There it will be seen that his communication writings are underpinned as much by appeals to information as they are by appeals to media. The second step of the inductive process will feature a visit to Innis’ history of the West. There, we shall see how his appeals to information, cognitive flux, and the dynamics of information flow came together in *Political Economy in the Modern State* (Innis, 1946).

Innis and information

While some Innis interpreters have made reference to the concept of information in his writings, most have ignored it. Instead, most characterizations of Innis’ theories tend to focus on the three propositions he explicitly made regarding media. Proposition one contends that the material properties of media engender in individuals and cultures a bias either toward the dimension of space or time. Innis’ second proposition suggests that communication technologies—over time—will lock communicants into one bias or another, a state that Innis referred to as the “monopoly of

knowledge.” In the final proposition, Innis argued that cultures can, through default or design, thwart the debilitating effects of media by actively constructing knowledge, and continually querying formulations already in circulation, an ethic Innis referred to as the “oral tradition” (Acland & Buxton, 1999; Babe, 2000; Watson, 2006).

While these three propositions are important, they provide little traction in explaining *why* Innis believed communication technologies produced cognitive effects leading to bias and cognitive flux. Attention to Innis’ writings on information and the dynamics supporting its dissemination, by contrast, provide a framework for a deeper understanding of Innis’ ideas (Bonnett, 2013). Innis rarely provided explicit definitions of the concepts he used, but his treatments of the term “information” in *Political Economy* (Innis, 1946) suggest he framed the word in qualitative and quantitative ways. With respect to the term’s qualitative connotation, Innis used it in a manner consistent with Gregory Bateson’s (2000) famous definition of information as “a difference which makes a difference” (p. 459). One way that information made a difference for Innis was by uniting data with meaning. Data referred to distinct patterns or events—percepts—instantiated in matter or energy. Meaning referred to formalisms that assisted in the perception of data, and its integration into larger semantic constructs.²

In the articles contained in *Political Economy* (Innis, 1946), the percepts that mattered the most to Innis were those associated with agent action, in the form of commerce, and agent interaction, in the form of price. These data, in Innis’ account, were expressed in formalisms that provided commercial intelligence and price data (Innis, 1946b, Innis, 1946e), content that was used to document “the emergence of a complex industrial and trading structure,” and content that indicated how agents might best operate within that structure: “The rapid and extensive dissemination of information was essential to the effective placing of labour, capital, raw materials, and finished products” (Innis, 1946c, p. 89). Information, in short, had a qualitative significance. It referred to percepts and their eventual subsumption into concepts by human actors. To the extent the issue has been considered, this is the connotation of “information” that also arises out of the Innis literature (Angus, 1997; Babe, 2002, 2005; Comor, 2002; Neill, 2006).

While these insights were important, Innis’ writings in *Political Economy* (Innis, 1946) suggest he was also concerned about information’s quantitative impact, in ways that mirror Wiener. In this context, the significance of information stemmed not from its semantics but rather from the number of words in circulation. Innis (1946e) expressed this concern in the preface to *Political Economy*, where he suggested that the printing press and radio in recent history had “enormously increased the difficulties of thought” (p. vii). Both inventions in conjunction with freedom of expression had led to “the production of words on an unprecedented scale,” initiatives that “made them powerless” (p. vii). Words were impotent, Innis argued, because his contemporaries in the 1940s, and those who had preceded them in the nineteenth century, had lost their capacity to construct words into larger constructs that commanded public attention, and were lasting. To support his point, Innis drew on the writings of nineteenth-century intellectuals ranging from Graham Wallas and Arnold Bennett to John Morley and George Gissing. Quoting Mark Pattison, Innis (Innis, 1946g) noted that “there is an organization of thought as well as of labour” (p. 77), an organization de-

defined as “a scientific formation of mind, a concert of the intellectual faculties” (p. 77). For Pattison, such a concert could not be obtained when there was a “rapid inculcation of unassimilated information,” which he argued stupefied “the faculties instead of training them” (p. 76). The current preoccupation with information overload is not a new one (Gleick, 2011; Menke, 2008). For Innis’, the ultimate end of such an overload was the flux of communication.

Innis’ history of the West, part one: The realization of balance

Innis’ (1946d) purpose in his earliest communication writings was to warn readers about the dangers posed by Pattison. It was also to propose a defence against information overload: balance. Balance, as Innis defined it in *Political Economy*, was an ethic that enjoined the distribution of control at multiple levels of human organization, nationally, internationally, socially, and individually. A healthy international system was comprised not only of states, but also transnational actors to restrain them, be they the church, commercial institutions, or informal networks of policymakers situated in Europe’s chancelleries (Innis, 1946c, 1946d, 1946f). A robust society was not comprised of one institution or class but rather of multiple groupings, each checking the pretensions and aspirations of their counterparts. Competition and constraint, Innis believed, were essential information management practices for cultures. Such practices could be deployed negatively through such vehicles as censorship. They could also be deployed positively through innovation. Institutions could devise new formalisms and technologies to enhance human control and perception of content (Bonnett, 2013). Innis (1946d) also labelled cultures as balanced when they were composed of individuals who governed their behaviour with the right mix of freedom and constraint. Such individuals were essential precursors for conservative democracy, political economy, and the emergence of a vibrant, innovative culture.

In Innis’ (1946d) account of the history of the West, Rome failed to grasp the necessity of balance, a failure in foresight and imagination that ultimately cost it its empire and its existence. In the fourteen centuries that followed, Europe emerged from the wreckage and began to consider what had gone wrong. From that sustained effort emerged the realization, articulation, and ultimately the application of the principles that make for a robust society. These principles in Innis’ (1946d) opinion reached their best fulfillment in the U.S. and Britain in the late eighteenth and early nineteenth centuries, with each attaining a balanced constitution.

Innis’ history of the West, part two: Information overload

But then, in Innis’ narrative, things fell apart. Britain, the U.S., Canada, and Europe were subjected to a rapid influx of information that eroded the intellectual, political, social, and cultural vitality of the Western world. In *Political Economy*’s communication articles, Innis (Innis, 1946) pointed to five factors to explain the advent of information overload in the nineteenth century, with four pointing to agents and infrastructure, and the fifth pointing to the positive feedback process of increasing returns. The first factor was business demand for information to sustain commercial activity, particularly in the wake of industrialization. The acquisition of profit and wealth depended on the rapid acquisition and distribution of information (Innis,

1946b, 1946c, 1946e). The second development was technical. Improvements in technology—particularly the convergence of steam and then electric power with the printing press, and the development of new methods for paper production—supported the rapid generation and distribution of content (Innis, 1946b, 1946c, 1946d).

The third important factor was the emergence of state-funded compulsory systems of education, such systems led to the emergence of a public, a new and important channel for information transmission that would have important geopolitical and cultural consequences (Innis, 1946a, 1946c). Fourth, Innis pointed to the emergence of a free and independent press, the agent Innis (1946a, 1946b) believed to be primarily responsible for catalyzing the information explosion of the nineteenth century. The press' commitment to the distribution of knowledge on a commercial basis initiated the fifth cause of the information glut, the emergence of a positive feedback process that encouraged the generation and distribution of ever-increasing quantities of information.

Innis' theory of history: A tale of cycles and monopolies, information and increasing returns

This juncture of Innis' narrative, however, raises an important question. What theoretical tradition did he use to assist him in his description of the dynamics of information flow, and its consequents? While Wiener drew on concepts from engineering to support his analysis, Innis (1946b) used economic theory to structure his histories, starting with constructs that described the emergence and trajectory of business cycles and monopolies. The history of human thought and culture, he wrote, was analogous to the progression of the business cycle. Its topology was not linear, but rather “a series of curves depending on technological advances” (p. 34). Further, the trajectory of human history was not continuous but rather was punctuated, showing cycles that embodied first growth and then stabilization. Quoting Jacob Burkhardt, Innis (1946d) argued that, “all spiritual growth takes place by leaps and bounds ...” (p. 127) while in a 1943 letter to his colleague Arthur Cole, Innis (1943) noted his “personal interest in public opinion – particularly the existence of broad plateaus of public opinion and the sharp breaks which occur in it from time to time...” (n.p.).

The punctuation point—or plateau—of any given cultural cycle was the monopoly of knowledge—and the respective bias of space or time that came with it. Innis (1951) identified this stage of the cultural cycle with the economic concept of equilibrium, noting that new media typically catalyze cultural cycles and that “a monopoly or oligopoly of knowledge is built up to the point that equilibrium is disturbed” (p. 3). For any economist of Innis' time, equilibrium presupposed a system that was, in physicists' terms, static, and in Wiener's terms, homeostatic. It presupposed a clock-like universe, in which the rules were invariant and the driving force at play was negative feedback, or in economists' parlance, diminishing returns (Bonnett, 2013). In his *Idea File*, Innis (1980) noted that cultural evolution typically took place at early stages of a cultural cycle, and that it was “very difficult at later stages when it [the practical and cognitive constituents of a given cultural cycle] becomes stabilized” (p. 51). Once a cycle had fully emerged, “the possibility of a sudden rapid adjustment of earlier periods disappeared” (p. 191).

While relying on the concept of monopoly to explicate the termination of cultural cycles, Innis drew on the concept of positive feedback, or increasing returns in eco-

nomics, to explain their emergence, movement, and evolution over time.³ At its most basic, the concern of increasing returns refers to markets whose firms enjoy a cycle of growth that is self-reinforcing and self-sustaining. Firms on the right side of an increasing returns market enjoy high profits, which they are able to exploit to reduce their costs, heighten their opportunities for exchange and growth, and then garner more profits. Businesses on the wrong side see their profits decline and their costs rise (Arthur, 1996; Waldrop, 1992).

Increasing returns is a construct that suggests that much of the initiative for emergent change and governance of the market rests at the system level, not the individual or institutional level. In *The Cod Fisheries* Innis (1940) argued that Britain failed to recognize the market limitations imposed by increasing returns, an oversight that—in part—precipitated its conflict with its American colonies, the American Revolution, and the collapse of the First British Empire. Increasing returns, for Innis, was a recurring dynamic in history, one that harboured great opportunity, and—if a person or policy-maker was not careful—great peril (Innis, 1940; Bonnett, 2013).

And for this reason, Innis continued to apply the concept in his writing: that which had proven central for his later economic writings became central for his communication histories. Innis' commitment to the concept is first indicated by comments made in a 1941 roundtable dedicated to the problems of the postwar. Innis (1941) by that point had already shifted his focus to communications, and during the roundtable, he argued that social scientists that were veterans of the First World War had “little excuse for forgetting either the lessons of the war or of the peace” (p. 118). The most significant lesson was the contribution “of Adam Smith and his successors as to the significance of division of labour” (p. 118). Now, what did he mean by that? The economist Kenneth Arrow (1994) notes that, “the concept of increasing returns has had a long but uneasy presence in economic analysis” (p. ix).

The opening chapters of Adam Smith's *The Wealth of Nations* put great emphasis on increasing returns to explain both specialisation and economic growth. Yet the object of study moves quickly to the competitive system The English school ... followed the competitive assumption, and quietly dropped Smith's boldly stated proposition that, “the division of labour is limited by the extent of the market,” division of labour having been shown to lead to increased productivity. (p. ix)

Put simply, Arrow's (1994) summary suggests that Innis, when referring to the term “division of labour” was thinking of more than the phenomenon and practice of task differentiation. He was also referring to the dynamic that gives rise to task differentiation, namely increasing returns. It further implies, given the stress Innis placed on the concept, and given the date in which he made it, that the concept plays a greater role in Innis' communication thought than his interpreters have heretofore appreciated. That conclusion is suggested first in brief by statements from Arrow and Innis. Arrow (1994) writes that in the wake of Adam Smith “other analysts in different traditions” (p. ix) clearly understood that increasing returns presented an important ramification for economic theory, namely “the incompatibility of increasing returns and perfect competition.” By virtue of that incompatibility, economists “developed theories of monopoly

and oligopoly to explain the economic system implied by increasing returns” (p. ix). Innis’ (1951) appropriation of increasing returns is suggested by a statement from *The Bias of Communication*, where he acknowledged his debt to business cycle and monopoly theory, and indicates that his purpose is to describe the impact of communication media on “the character of knowledge and to suggest that a monopoly or oligopoly of knowledge is built up to the point that equilibrium is disturbed” (pp. 3–4).

The centrality of increasing returns in Innis’ communication thought is further indicated by the historical narrative in *Political Economy*. In “The Newspaper in Economic Development,” Innis (1946b) argues that the American and British press in the nineteenth century acquired the freedom, the technology, and the incentive to distribute knowledge on a commercial basis. That decision put into effect a self-sustaining process of circular-causation that heightened information circulation, and the advertising revenue necessary to sustain it. Quoting Daniel Stuart, the founder of the *Morning Post*, Innis (1946b) noted: “Advertisements act and react. They attract readers, promote circulation, and circulation attracts advertisement” (p. 4). Aside from tying information distribution to the acquisition of commercial revenue, Innis (1946b) argued that newspapers further contributed to the information glut by pursuing “measures designed to increase the numbers of readers and to widen the market” (p. 17). Newspapers accomplished this by pressing for the construction of transportation and communication infrastructure. As was the case with advertising, Innis (1946b) argued that newspaper pressure on government to construct infrastructure initiated a positive feedback process that led to the construction of more infrastructure and the distribution of more information:

The newspaper has been a pioneer in the development of speed in communication and transportation. Extension of railroads and telegraphs brought more rapid transmission of news and wider and faster circulation of newspapers; and newspapers, in turn, demanded further expansion of railroads and telegraph lines. (p. 32)

For Innis, the impact of the rapid expansion in circulating information effected by increasing returns—at the social and individual level—was profound. It undermined the checks and balances that had moderated institutional behaviour and governed individual behaviour in the nineteenth century. The rapid influx of information undermined the individual’s capacity to make reasoned assessments of his or her surroundings. Instead of viewing the world through reasoned constructs, the individual lost the capacity to perceive or create them, and was reduced to reacting to one shard of information, and then another. All was flux (Innis, 1946; Innis, 1946b; Innis, 1946e). The world had become an alarming place, and the political, economic, and cultural implications of the flux of communication proved deeply troubling for Innis.

The disruptive impact of increasing returns: A case study from economics

Innis’ reaction was due to his fundamental belief that social division was a necessary constituent of a healthy society. It provided the basis for the institutional, social, and cultural mechanisms that would enable one part of the social fabric to check the excess

of another. His reaction was also due to his fear of the disruptive impact of increasing returns, which he inferred from economic theory and his own research on the history of the Klondike gold rush. Drawing on Thorstein Veblen's writings on cyclonics (Veblen, 1892, 1893; Innis, 1936), Wesley Clair Mitchell's (1913) writings on business cycles, Alfred Marshall's writings on increasing returns (Marshall, 1890), and others, Innis (Lower & Innis, 1936) presented his readers with *Settlement and the Mining Frontier*, his account of the Yukon gold rush, a narrative in which the territory's economy went through the following trajectory: increasing returns, systemic instability in the form of price fluctuation, and the emergence of nationalism and irrational behaviour in the Yukon and Canadian publics.

For Innis (Lower & Innis, 1936), the Klondike gold rush was significant because of the "jerk which it gave a continent wallowing in depression." Its intensity was such that Innis compared its impact to a cyclone, and declared it to be "a study in economic dynamics" (p. 183), or, to use a different word, cyclonics. Economic systems governed by cyclonics were distinguished by the rapidity with which they experienced successive phases of economic evolution. Changes that under normal circumstances might have taken decades emerged in as few as five to ten years in a cyclonic system. The reason why one economic system became cyclonic while another did not, Innis argued, centered on the characteristics of the given commodity under extraction. Some commodities, such as gold, by virtue of their high value and easy mobility, functioned as catalysts for the rapid emergence of new economic systems. Due to their presence in a given locale, they were able to attract personnel, equipment, and capital at a rate and quantity that less lucrative resources, such as timber, could not. And because they were able to rapidly attract and mobilize large quantities of labour, cyclonic economies stimulated the very process Adam Smith predicted when masses of actors gather and undertake economic activities and exchange: the division of labour (Lower & Innis, 1936).

The Klondike gold rush was an exemplar for Innis in this respect. It prompted economic diversification—the division of labour—in the form of commercial activity to support the mining industry and stimulated the emergence of other mining activities, specifically silver and lead (Lower & Innis, 1936). It further stimulated the emergence of increasing returns, high profits that funded the construction of new transport infrastructure, and the introduction of novel methods and novel technologies for extracting gold. These innovations enabled individual and then corporate miners to enter a cumulative causal process that allowed them to extract more gold more cheaply. Gold's effectiveness in "commanding advanced technique," Innis (Lower & Innis, 1936) writes, "increased the production of gold and produced a cumulative tendency" (p. 258). Quoting the Yukon's Gold Commissioner for 1901, Innis noted: "Every reduction in freight rates, every reduction in the cost of living in the Yukon territory makes possible the introduction and operation of a higher class of machinery and cheaper production of gold ... Each change that lessens the cost of production increases the area for profitable working" (p. 217).

The onset of increasing returns had important and destabilizing consequences for the Yukon, according to Innis. One metric that economists use to assess the relative stability of a business cycle is variation in price. When the price of commodities and other

items fluctuate widely, the system can be said to be in a state of crisis. The economist John Maurice Clark (1917), in a reference to W.C. Mitchell's (1913) *Business Cycles*, notes that the definition of systemic crisis that emerges from Mitchell's book is one in which "business adjustments do not stop at a point of equilibrium, but go on to a point from which a more or less violent reaction is inevitable, and so on without apparent end" (Clark, 1917, p. 217). Innis knew Mitchell's work. In fact, he identified its substance and significance with Veblen's work on dynamics and prices (Innis, 1956). It is perhaps not surprising, then, that in describing the flux and division of labour engendered by an increasing returns economy, one consequent that Innis noted was a Yukon economy characterized by fluctuating prices: "Prices fluctuated widely as a result of the season of the year and of numerous unpredictable factors. A general lack of knowledge of the goods on hand made the market unsteady" (Lower & Innis, 1936, p. 194).⁴

In Innis' (Lower & Innis, 1936) account, the Yukon's cyclonic economy and increasing returns prompted a second important consequent, acts that by Innis' measures were irrational or promoted dangerous nationalism. In the conclusion of his account of the gold rush, he notes that "it is an interesting speculation as to the effects of the Yukon on the feverish activity and the psychology" (p. 269) on Canadian economic policy and North American diplomacy. According to Innis, the gold rush prompted the construction of two transcontinental railway lines, initiatives that Innis would criticize in a 1938 article for making little economic sense. The Grand Trunk Railway's (GTR) creation of a rail line to the west, in particular, was a poor decision since its western terminus, Prince Rupert, provided a poor entryway into Western Canada, and the line enjoyed no direct connection with the GTR's main network to the east (Innis, 1956a, p. 226). The gold rush also prompted negative nationalism in Canada, with Innis (Lower & Innis, 1936) noting, "the bitterness which accompanied settlement of the Alaska boundary dispute was a result of the character of the boom" (p. 269).

The disruptive impact of increasing returns: A case study from communications

Such was the behaviour that emerged from cyclonic economic systems experiencing increasing returns. And such was the behaviour Innis described in *Political Economy* for socio-cultural systems: increasing returns, in the form of heightened circulating information; systemic instability, in the form of fluctuating public opinion; and insane, irrational behaviour and systemic collapse, in the form of nationalism and a march to two World Wars. For Innis, this unfortunate turn of events emerged because the wisdom of the crowd could not be formulated or expressed in an environment saturated by information. In a world of flux the basis of political decision-making became not reason but rather mindless imitation, mimicry induced by passion and fear. That passion, in his reading, induced the West's citizenry to forget that they had an international economy and other long-term interests to protect. That fear induced them to derive their identity solely from the nation-state, at the expense of social and transnational sources of identity (Innis, 1946c). The public became hostage to the needs and impulses of the moment. And like any system caught in a surfeit of information, its inhabitants, hindered by ignorance and fear of their circumstances, swayed recklessly from one position to the next:

It is worth noting that large majorities in political elections accompanied the spread of the newspaper on a large scale in England after the sixties in the last century, and the spread of the radio on this continent. Swings in public opinion are more violent with new inventions in communication, and independent thought is more difficult to sustain. (Innis, 1946e, p. vii)

To Innis' great disappointment, the contagion of instability spread from society to the academy. Noting the implications of the "Freudian concern with the irrational" (p. 95) for the social sciences, Innis (1946c) noted "with alarm the changing fashions in economics" (p. 95)

The breakup of the classical tradition of economics is an indication of the powerful influence of fashions in our times. At one time we are concerned with tariffs, at another with trusts, and still another with money. As newspapers seldom find it to their interest to pursue any subject for more than three or four days, so the economist becomes weary of particular interests or senses that the public is weary of them and changes accordingly. And this paper will be cited as an obsession with the obsession with the immediate. There is a need for a study of economics and insanity supporting that of Durkheim on religion and suicide. (pp. 95–96)

Like Wiener, Innis (1946c) also suggested a linkage between information overload, system instability, and individual and collective insanity. In "On the Economic Significance of Cultural Factors" he writes "that man as a biological phenomenon has been unable to sustain the excessive demands of rationalism evident in the mathematics of the price system and of technology" (p. 99). He furthered that argument by asking rhetorically: "Is the emergence of Freud and the psychologists a result of the spread of irrationalism or an effort to meet the problems of irrationalism" (p. 99). For Innis (1946c), the answer plainly was the former:

The outbreak of irrationality, which in the early part of the twentieth century became evident in the increasing interest in psychology following the steadying effects of commerce in the nineteenth century, is the tragedy of our time. The rationalizing potentialities of the price system and its importance in developing powers of calculation in the individual have failed to prevent a major collapse. (pp. 98–99)

That collapse, in Innis' (Innis, 1946f) estimation, precipitated two global conflicts in the twentieth century and offered little hope for evading a third. "Why," he asked in one of the most personal and passionate passages he ever wrote, "has European civilization turned from persuasion to force or from ballots to bullets?" (p. 57) He pressed his readers to remember "how prodigal we have been with young life, our most cherished possession, and how careful we must be with that which is left to us" (p. 63). The way to exercise that care was to remember the lesson of the Great War, the lesson that societies are subject to the process underlying the division of labour, the process that produces information overload and its consequent catastrophic effects.

Implications and questions

What implications does this brief, comparative study present for understanding the

respective intellectual histories of the cybernetics and Toronto schools of communication? For scholars concerned with the history of cybernetics, this reading presents two points worth considering. The first is one of simple recognition. Harold Innis, an important contemporary, in a different “school” of communication on the margins of cybernetics, independently gravitated toward the same sets of concerns as Wiener, Arturo Rosenblueth, and other founders of cybernetics.⁵ While contemporaries in both schools knew of their counterparts, and scholars such as Donald Theall (2001), William Buxton (2004), William Kuhns (1971), and Michael Darroch (2016) have made attempts to identify parallels—or at least identify some relation—between the two camps,⁶ few commentators then or now have appreciated the extent of Innis’ preoccupation with information, and the dynamics underlying its dissemination.⁷

The parallel between the two, however, while interesting, is not particularly significant when considered on its own. Parallel invention, after all, is a common occurrence in the history of ideas and the history of technology. Darwin had his Wallace, and it would appear that Innis had his Wiener (or vice-versa, depending on your point of view). Wiener (1994) even made note of the phenomenon in a book he wrote on the history of invention. The parallel is only significant, if we use it to prompt a second consideration: how its discovery deepens our understanding of the intellectual and cultural contexts that gave rise to cybernetics. Arthur Mindell (2002) has rightly focused scholarly attention on cybernetics’ connection to engineering. However, his study of Innis and Richard Menke’s (2008) *Telegraphic Realism* suggest that concerns regarding information and positive feedback were extant in multiple domains in the nineteenth and early twentieth centuries, including literary criticism, political philosophy, and economics. It will be interesting and important for historians of both schools of communication to explore why nineteenth-century scholars from disparate fields were saying very similar things, and what, if any, links existed between them.

For scholars concerned with the Toronto School, this study presents a number of important implications. The first is that *Political Economy in the Modern State* (Innis, 1946) is as important a work as its more celebrated counterparts, *Empire and Communications* (Innis, 1950) and *The Bias of Communication* (Innis, 1951).⁸ Traditionally, scholars have often treated the writings in Innis’ first communication anthology as something of a poor cousin, a prototype in which well-known concepts such as bias and the monopoly of knowledge are seen to be latent or in development. This article suggests there is a better way to view *Political Economy* (Innis, 1946). It should not be seen as an embryonic work but rather the expression of a different side of Innis’ philosophy of history. In later works the focus is on the bias of communication, which is why the concept, and related concepts such as monopoly, are so lightly treated in *Political Economy* (Innis, 1946). Innis had a different purpose in his first anthology and that was to introduce readers to bias’ mirror consequent: the flux of communication.

A second implication of this reading is that concepts such as information and increasing returns were as important for Innis and his reading of history as his better-known concepts of bias, the monopoly of knowledge and the oral tradition. For Innis scholars, this finding is important because it suggests they may want to read his later anthologies with these two concepts in mind. As we saw from Kenneth Arrow (1994),

economists historically have linked the concept of increasing returns with monopoly and oligopoly theory. We may find that Innis (1950, 1951) did as well in *Empire and Communications* and *The Bias of Communication*. This finding is also important because it suggests an underlying unity binds the economic and communications writing in Innis' corpus. Recently, interpreters such as Alexander John Watson (2006) and Robert Babe (2015a, 2015b) have argued that the earlier economic histories should be seen as conceptually and philosophically separate from the communication writings produced after 1940. The substance of *Political Economy*, however, as well as close readings of works such as *Settlement and the Mining Frontier* (Lower & Innis, 1936) and *The Fur Trade* (Innis, 1940), suggest that this view is mistaken. Innis meant what he said when he insisted that he had applied conceptual tools from his economic histories to inform his communication writings. Increasing returns was one of those tools, and others were applied as well (Bonnett, 2013). Innis' work should not be seen as a fragmented corpus. It is characterized, instead, by a fundamental unity, a philosophy of history built on the concept of emergent change.

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Notes

1. The remaining three were *Empire and Communications* (Innis, 1950), *The Bias of Communication* (Innis, 1951), and *Changing Concepts of Time* (Innis, 1952).
2. This way of defining information is consistent with the General Definition of Information (GDI), a standard in information science and more recently in the philosophy of computing and information (Florida, 2007).
3. Innis' exposure to the concept of increasing returns can be easily demonstrated. Among other sources, Innis would have learned of it from Alfred Marshall's (1890) classic *Principles of Economics*, where the concept is explicitly mentioned and described. Innis mentions reading the work as a graduate student in his recently published 1952 autobiography (Innis, 2016). Innis (1946a, 1946b) also referenced *Principles of Economics* three times in the communication essays of *Political Economy in the Modern State*. Innis was also exposed to the dynamics of economic growth and collapse in Thorstein Veblen's writings, particularly through his concept of cumulative causation, which for all intent and purpose refers to the same thing as increasing returns (Bonnett, 2013). Economists' identification of positive feedback with increasing returns is discussed in Mitchell Waldrop's (1992) *Complexity: The Emerging Science at the Edge of Order and Chaos*.
4. It should be noted, however, that Innis' explanations for why crises occurred typically varied from those provided by Mitchell (1913) and Clark (1917, 1923). While the latter two generally focused on endogenous factors in business cycles to explain their declines and fluctuations, Innis (1936) through his work on cyclonics, typically pointed to exogenous factors such as the supply of gold. Their measure of system stability—price—was, however, the same.
5. William Christian's (Innis, 1980) edited edition of Innis' notebooks indicates that Innis read *Cybernetics* in late 1951 or early 1952, after his major works in communications had already been written (see Innis, 1980).
6. Examples of communication researchers referring to opposite numbers at MIT or Toronto include Karl Deutsch (1952), who reviewed Innis' *The Bias of Communication* (1951) in 1952. Marshall McLuhan and Innis indicated their knowledge of Deutsch's work, and, in turn, that of Wiener in correspondence undertaken in 1951. Their correspondence suggests that Innis had not heard of Wiener until McLuhan's reference to his work in their correspondence. See (Innis, 1951a).

7. One work that is a partial exception to this characterization is William Kuhns' (1971) *The Post-Industrial Prophets*. In his work, Kuhns perceptively noted that Innis is "often closer in his thought to the cybernetic interpretation of Norbert Wiener" (p. 143) than the array of historians and philosophers Innis used as sources for his communication studies. Innis' interpretation is an attempt to read history "through forms rather than content, through information flow and control rather than political heroes, wars, and trade" (Kuhns, 1971, p. 143). Unfortunately, Kuhns never provided a sustained reading to support this point, save for noting that both authors displayed an interest in exploring systems characterized by stability and negative feedback. Kuhns' book does not refer to *Political Economy in the Modern State* (Innis, 1946), nor does it refer to Innis' interest in positive feedback, or Innis' common concern with Wiener on the systemic pathologies that emerged by virtue of positive feedback.

8. Recent contributions (see Babe, 2015b; Bonnett, 2013) have begun to reverse the comparative neglects of *Political Economy* (Innis, 1946) and provided extended readings of the anthology's contents. However, more attention is warranted and needed.

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