

Course Outline: Cybernetics, Complexity, Chaos, and Critical Theory

Course Description: Cybernetics, complexity theory, and chaos theory emerged in the mid-twentieth century from the scientific study of systems exhibiting dynamic behavior and challenging to predict or control using linear methods. This course explores the intersections of these three fields with critical theory and continental philosophy. Students will examine the intellectual foundations and implications of "the three C's," with a focus on understanding concepts such as system, feedback, emergence, phase changes, dissipative structures, bifurcation, attractors, self-organization, chaos and catastrophe. Particular attention will be given to the points where cybernetics, complexity, and chaos thinking intersect with strands of critical social theory. Examples include the role of heterodox Marxist Alexander Bogdanov as a precursor of systems thinking; the influence of cybernetics on Foucault, Deleuze, and Guattari; the feminist cybernetics inaugurated by Donna Haraway and Sadie Plant; the relation of complexity theory to concepts of intersectionality; and the place of chaos and complexity theory in the analysis of the "polycrisis" of contemporary capitalism and the search for radical alternatives.

Instructor: Nick Dyer-Witford, ncdyerwi@uwo.ca. **Office Hours:** Zoom, by appointment.

Requirements: (subject to revision dependent on enrollment)

1 in class presentation: 25%

1 paper proposal: 700 words including bibliography 10%

1 major research paper 7000 words including bibliography 50%

Seminar participation: 15%

For further information see "Notes on Evaluation" below.

Schedule of Topics and Readings

This schedule may be adjusted after the first week of classes to reflect participant interests.

Readings will be available as downloadable PDFs on the seminar OWL site.

Schedule of Topics and Readings

Week 1) Systems: We begin by reviewing our collective interest in and knowledge of cybernetics and complexity theory looking at recent landmark discussions of these concepts, and outlining the topics the seminar will cover, starting with the mid-20th century emergence of "systems" thinking. Readings: Voss, G. (2024) *Systems Ultra: Making Sense of Technology in a Complex World*, Chapter 1; Geoghegan, B.D. (2023) *Code: From Information Theory to French Theory*, "Introduction"; Hui Y (2024) "Why Cybernetics Now" in *Hi ed Cybernetics for the Twenty First Century*.

Week 2) Cybernetics: This session will explore the core doctrines of cybernetics, their historical context successive iterations as first, second and third order cybernetics, and short-term fate and long-term influence. Readings: Wiener, N. Extracts from (1948) *Cybernetics: Or Control and Communication in the Animal and the Machine* and (1954) *The Human Use of Human Beings*; Johnston J (2008) *The Allure of Machinic Life: Cybernetics, Artificial Life, and the New AI*,

Week 3) Deviations: Various thinkers and movements responded to cybernetics' alignment with the US military industrial complex by attempts at reappropriation. We examine the heretical cyber-socialism of Stafford Beer and the counterculture adoption of cybernetics. • Readings: Pickering, A

(2024) “Cybernetics in Britain” In Hi, Y ed. *Cybernetics for the 21st Century*. Ashby, W. R, extracts from (1956) *An Introduction to Cybernetics* and Beer, S (1972) *Brain of the Firm*. Dubberly H. and Pangaro, P. (2015) “How cybernetics connects computing, counterculture, and design.”

Week 4) Resistances: French intellectual reception of cybernetics was strong and varied, combining adoption and rejection. It included some of the most eloquent and strenuous repudiations of cybernetics, in a lineage of anti-capitalist thought running from the Situationists to the anarcho-communist Tiqqun. Readings: Lafontaine, C. (2007). *The Cybernetic Matrix of ` French Theory`*. Jorn, A (2006), ‘The Situationists and Automation’, Routhier, D. (2024) “A Situationist Portrait of Power: Cybernetics, May ’68, and The Situationist International”; Tiqqun, *The Cybernetic Hypothesis* (2001).

Week 5) Accelerations: Even while cybernetics as a school of thought faded cyber concepts soon saturated digitizing capitalism. Haraway’s “Cyborg Manifesto” is a landmark of feminist appropriation; as significant was the Cybernetic Culture Research Unit at the University of Warwick, inaugurated by cyberfeminist Sadie Plant, then shaped by Nick Land as the dark side laboratory for accelerationisms, right and left.. Readings: Haraway (1985) “A Cyborg Manifesto”; Plant, S. (1997). *Zeros and ones : digital women and the new culture* ; Le V 'The Most Radical Philosopher: Putting The Cyber Back in Sadie Plant’s Cyberfeminism' (2022) : Land N extracts from. (2018). *Fanged Noumena : collected writings 1987-2007*; Gardiner M (2022) “Automatic for the People? Cybernetics and Left-Accelerationism.”

Week 6) Complexity: Meanwhile, on the brink of the twenty first century, systems theory and cybernetics were melding with a new complexity theory, drawing on research from natural sciences into dynamic, nonlinear change, emergence, swarm behavior, and operations "on the edge of chaos.” Readings: Prigogine, I (1987) “Exploring complexity”; Gleik J (1988) *Chaos: Making a New Science* (Chapters 1 and 2. Urry, J. (2006). “Complexity”. Keller, E. F. (2005). “Ecosystems, Organisms, and Machines.”

Week 7) Assemblages: In parallel with this development, Deleuze and Guattari’s concepts of assemblage, rhizomes and flows is now understood was an extraordinary translation of complexity theory in the language of social and psychoanalytic theory, suffused with a radicalism that many of their interpreters attempt to discard. Readings: DeLanda, M (1991) ‘Nonorganic Life’; Protevi J (2006) “Deleuze, Guattari and Emergence”; Deleuze G and Guattari F (1987) “Rhizomes” ; Guattari F *Three Ecologies*.

Week 8) Autopoiesis: Complexity concepts also overtook the cybernetic concept of of "autopoiesis" developed by Chilean biologists Humberto Maturana and Francisco Varela, and then transferred to the realm of social science by stems theorist Niklas Luhmann, and then challenged by way microbiologist Lynn Margulis concept of symbiogenesis by Haraway’s idea of “sympoiesis”. Readings: Maturana H and Varela F (1972) *Autopoiesis and Cognition: The Realization of the Living* (extracts); Luhmann N (1995) [1984]; Haraway D (2016), *Staying with the Trouble : Making Kin in the Chthulucene*, Chapter 3.

Week 9) Markets: Complexity theory is widely interpreted as vindicating the neoliberal revival of “free market” capitalism. However, this view is challenged from the left by the new iterations cybernetic planning theory and by applications of complexity theory to issues of intersectional

division. Readings: Hayek F (1945) *The Uses of Knowledge in Society*; Holland J (2014), extracts from *Complexity: A Very Short Introduction*. Dyer-Witheford N (2013), *Red Plenty* Platforms 1-27; Walby, S. (2007). *Complexity Theory, Systems Theory, and Multiple Intersecting Social Inequalities*.

Week 10) Polycrisis: Since 2020 amidst pandemic, war and global boiling version of complexity theory has been popularized via the notion of a civilizational "polycrisis," a term passed from the work of Edgar Morin to elite discussions at Davos, and thence in the work of contemporary historian Adam Tooze, in a discourse with ominous echoes of earlier theories about "the collapse of complex societies". Readings: Morin E extract from (1999). *Homeland earth : a manifesto for the new millennium*, Tooze A (2022) "What is the Polycrisis" and "Crisis Pictures"; Bardi, U., et al. (2019). "Toward a General Theory of Societal Collapse."

Week 11) Neo-cybernetics: At the same time, s a wave of neo-cybernetics, integrating complexity theory and cybernetics, with an emphasis on thermodynamics, ecology, and evolutionary processes. Can this new synthesis [provide part of the theoretical repertoire for a new wave of emancipatory social struggles against disaster? Readings: Hui Y (2024) "Machine and Ecology"; Hayles K (2024) "Detoxifying Cybernetics: From Homeostasis to Autopoiesis and Beyond"; other texts TBD.

12) Plenary: In the final session, we shall workshop participants' term paper proposals.

Presentation Topics: Seminar participants will give presentations selected from a list of possible topics and supporting readings; or may ask to present on other readings from the course syllabus; or propose their own topic for approval by the instructor. The aim of the presentation is to make your topic legible to other seminar participants.

The list of suggested presentation topics will include topics such as Wiener and Leibniz; cybernetics in China; Canguilhem and cybernetics Lacan and cybernetics; Foucault and cybernetics; Parisi on cybernetics and AI; "systems thinking" and the Vietnam war; "systems thinking" and the Club of Rome report ; Simondon on cybernetics and metastability; anarchism and cybernetics; the Habermas – Luhmann debate on social systems: Margulis and symbiogenesis; Malabou on plasticity, catastrophe and cyberanarchy; Turchin on "ultrasociety" and Cliometrics; Tainter and "the collapse of complex societies"; Wark on Bogdanov and tektology; Marxism and polycrisis; Keller on "self-organization"; intersectionality and complexity theory; Varela and autopoiesis; Stengers on complexity and capitalism; Hui on cosmotechnics.

Working Bibliography: Includes both required readings and other texts useful for presentations and essays; further items to be added.

Ashby, W. Ross (2015) [1956] *An Introduction to Cybernetics*. New York: Martino.

August, V. (2022). Network concepts in social theory: Foucault and cybernetics. *European Journal of Social Theory*, 25(2) 271–291. <https://doi.org/10.1177/1368431021991046>

Bardi, U., Falsini, S., & Perissi, I. (2019). Toward a General Theory of Societal Collapse: A Biophysical Examination of Tainter's Model of the Diminishing Returns of Complexity. *BioPhysical Economics and Resource Quality*, 4(1). <https://doi.org/10.1007/s41247-018-0049-0>

- Bates, D. (2014) "Unity, Plasticity, Catastrophe: Order and Pathology in the Cybernetic Era". In: Lebovic, N. and Killen, A. ed. *Catastrophes: A History and Theory of an Operative Concept*. Berlin, Boston: De Gruyter Oldenbourg, pp. 32-54.
- Beer, S. (1972). *Brain of the firm: the managerial cybernetics of organization*. London: Allen Lane the Penguin Press.
- Bogdanov, A (2016) [1923]. "The Science of the Future." In his *The Philosophy of Living Experience: Popular Outlines*. Leiden: Brill, pp236-248.
- Chehonadskih, M (2023) "The Science of Organisation". In: *Alexander Bogdanov and the Politics of Knowledge after the October Revolution*. New York: Palgrave Macmillan pp 61–93
- Clarke, B., & Hansen, M. B. N. (Mark B. N. (2009). *Emergence and embodiment : new essays on second-order systems theory*. Durham: Duke University Press.
- DeLanda, M (1991) 'Nonorganic Life', in Jonathon Crary and Sanford Kwinter (eds), *Incorporations*, New York: Zone Books, pp. 129–67.
- Deleuze, G. & Guattari, F. (1987). *A thousand plateaus : capitalism and schizophrenia*. Minneapolis: University of Minnesota Press
- Dubberly H. and Pangaro, P.(2015) "How cybernetics connects computing, counterculture, and design." In Blauvelt, A. (Ed. *Hippie modernism : the struggle for utopia*. Minneapolis: Walker Art Center. <https://staging.dubberly.com/cybernetics/article-inside-text/>
- Dyer-Witford N (2013) "Red Plenty Platforms". *Culture Machine* 13, 1-27.
- Foerster, H. (2003) [1979]. "Cybernetics of Cybernetics". In: *Understanding Understanding*. Springer, New York, NY. https://doi.org/10.1007/0-387-21722-3_13
- Galloway, R.A. 2014. "The Cybernetic Hypothesis" *Differences. A Journal of Feminist Cultural Studies* 25 (1): 107–131
- Keller, E. F. (2005). "Ecosystems, Organisms, and Machines. *Bioscience*" 55(12), 1069–1074.
- Gardiner ME. (2022) "Automatic for the People? Cybernetics and Left-Accelerationism". *Constellations*. 2022; 29: 131–145. <https://doi-org.proxy1.lib.uwo.ca/10.1111/1467-8675.12528>
- Geoghegan, B.D. (2023) *Code: From Information Theory to French Theory*. Durham N.C.: Duke University Press
- Gleik J (1988) *Chaos: Making a New Science*. London: Penguin
- Guattari, F. (2000). *The three ecologies*. London ; Athlone Press.
- Habermas J (1987) *Theory of Communicative Action: Vol 2 System and Lifeworld*. New York: Beacon Press.
- Haraway, D. (1985)"A Manifesto for Cyborgs: Science, Technology, and Socialist Feminism for the 1980s." *Socialist Review*, 15(2): 65–107.

- Haraway, D. (2015) *Staying with the Trouble : Making Kin in the Chthulucene*. Durham: Duke University Press.
- Hayek F (1945) "The Use of Knowledge in Society," *American Economic Review* 35, 519–20;
- Hayles, K (1999) *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature and Informatics*. Chicago: University of Chicago
- Holland JF (2014) *Complexity a Very Short Introduction*. Oxford: Oxford University Press.
- Hui, Y (ed.) (2024) *Cybernetics for the 21st Century: Epistemological Reconstruction*. Hong Kong.
- Johnston J (2008) *The Allure of Machinic Life: Cybernetics, Artificial Life, and the New AI*. MIT Press: Boston.
- Jorn, A 2006, 'The Situationists and Automation', in *Situationist International Anthology*, edited and translated by Ken Knabb, pp. 55–8, Berkeley, CA: Bureau of Public Secrets.
- Lafontaine, C. (2007). The Cybernetic Matrix of `French Theory'. *Theory, Culture & Society*, 24(5), 27–46. <https://doi.org/10.1177/0263276407084637>
- Land, N. (2018). *Fanged Noumena : collected writings 1987-2007*. Falmouth, England ; Urbanomic
- Le, V. (2022) 'The Most Radical Philosopher: Putting The Cyber Back in Sadie Plant's Cyberfeminism', *Cosmos and History: The Journal of Natural and Social Philosophy*, 18(2)
- Luhmann N (1995) [1984] *Social Systems*. Stanford CA: Stanford Press.
- Maturana H and Varela F (1972) *Autopoiesis and Cognition: The Realization of the Living*. Boston: DA Reidel
- Medina, E (2014) *Cybernetic Revolutionaries: Technology and Politics in Allende's Chile*. MA: MIT Press
- Morin, E. (1999). *Homeland earth : a manifesto for the new millenium*. Cresskill, N.J: Hampton Press
- Pickering, A (2010) *The Cybernetic Brain: Sketches of Another Future*. Chicago: University of Chicago.
- Pickering, A (2024) "Cybernetics in Britain" In Hi, Y ed. *Cybernetics for the 21st Century*. Hong Kong: Hanart Press 111-127
- Plant, S. (1997). *Zeros and ones : digital women and the new culture* (. New York, NY: Doubleday.
- Prigogine, I (1987) "Exploring complexity" *European Journal of Operational Research* 30 97-103 97
- Protevi J (2006) "Deleuze, Guattari and Emergence" *Paragraph*, 29: 2, 19-39
- Routhier, D. (2024) "A Situationist Portrait of Power: Cybernetics, May '68, and The Situationist International. *Historical Materialism* <https://doi-org.proxy1.lib.uwo.ca/10.1163/1569206x-bja10038>

- Ruyer, R. (2024). 1954 French]. *Cybernetics and the origin of information* (A. Berger-Soraruuff, A. Iliadis, D. W. (Daniel W. Smith, & A. Woodward, Trans.). Lanham: Rowman & Littlefield.
- Spies, M., & Alff, H. (2020). *Assemblages and complex adaptive systems: A conceptual crossroads for integrative research?* *Geography Compass*, 14(10). <https://doi.org/10.1111/gec3.12534>
- Turner, F. (2006). *From counterculture to cyberculture : Stewart Brand, the Whole Earth Network, and the rise of digital utopianism*. Chicago: University of Chicago Press
- Tiqqun. (2001) 'The Cybernetic Hypothesis', *Tiqqun 2*, <https://theanarchistlibrary.org/library/tiqqun-the-cybernetic-hypothesisvon>
- Urry, J. (2006). Complexity. *Theory, Culture & Society*, 23(2–3), 111–115. <https://doi.org/10.1177/0263276406062818>
- von Bertalanffy, L. (1968) *General System Theory: Foundation, Development, Application*. George Braziller: New York
- Voss, G. (2024) *Systems Ultra: Making Sense of Technology in a Complex World*. New York: Verso.
- Walby, S. (2007). "Complexity Theory, Systems Theory, and Multiple Intersecting Social Inequalities. *Philosophy of the Social Sciences*, 37(4), 449–470. <https://doi.org/10.1177/0048393107307663>
- Wark, M (2015) *Molecular Red: Theory for the Anthropocene*. London: Verso
- Weaver, W. (1948) "Science and Complexity", *American Scientist* 36:4, 536-544.
- Wiener, N. (1948) *Cybernetics: Or Control and Communication in the Animal and the Machine*. New Orleans: Quid Pro.
- Wiener, N (1954)*The Human Use of Human Beings*. New York: Da Capo,