Systems and Simulations
Four weird guys, war machines, and contemporary artist practice

This project is adjacent to our earlier presentation but comes from a longer-standing obsession: generative systems and simulation games. I've always been drawn to making things that behave on their own, often to a fault. I add complexity my work doesn't strictly need just because I want it to move, react, or evolve.

That impulse—toward generative, semi-autonomous systems—comes from growing up with simulation games like SimCity and other sandbox digital experiences. Later, when I began making games, I became interested in simulation as a medium within my art practice: how systems can carry aesthetic and political ideas.

Here, I want to sketch a history of simulation as technology and media, leading toward contemporary artistic practices and my own experiments. The story is told through four figures:

- Norbert Wiener
- Stafford Beer
- Jay Wright Forrester
- Will Wright

The through-line is surprisingly consistent: again and again, digital technology emerges out of attempts to shoot down airplanes in World War II, and then gets generalized into a way of thinking about cities, economies, politics, and art.

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Norbert Wiener and the Ontology of the Enemy

Norbert Wiener is often called the father of cybernetics. He was an immensely influential American mathematician who, in the 1930s, worked on information theory and quantum theory, and in the 1940s at MIT helped develop early computing devices for the U.S. war effort.

One key project was an **anti-aircraft predictor**: a vacuum-tube computer designed to help target and fire on enemy aircraft. In practice, it never moved far beyond simulation. Instead, Wiener and his collaborators built something like an installation:

- A projection of light on a wall represented an aircraft.
- A user with a joystick tried to track and "aim" at the moving target.

This was essentially an early flight simulator. It required not only mechanical apparatus but also a way to generate plausible, randomized flight paths for the simulated aircraft. Out of this problem—anticipating an enemy's future position from noisy data—Wiener began to articulate **cybernetics**.

Cybernetics, in his definition, is:

> “The science of communication and control in the animal and the machine.”

The key idea is that **feedback loops** govern systems in a way that’s largely independent of whether they’re made of flesh or metal. Servomechanical diagrams from his lab show motors with inputs, outputs, and feedback channels that let them correct their behavior. Feedback becomes a basic structural principle.

A book called *The Ontology of the Enemy* digs into the fact that cybernetics is born from the attempt to anticipate and counter an enemy’s actions. You are trying to aim your gun at a plane controlled by someone who is explicitly your enemy. As a result, the “other” enters this new ontological framework as an adversary whose behavior must be modeled and predicted. That adversarial framing later shows up in game theory, mutually assured destruction, and many other Cold War structures of thought.

Wiener’s first book, *Cybernetics*, is followed by *The Human Use of Human Beings*, where he responds to the directions cybernetic networks are taking—particularly as they are applied to social and political systems. The pattern we’ll see with all four figures begins here: a technical project aimed at solving a military problem opens onto a general, sometimes disturbing way of modeling humans within systems.

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Stafford Beer and Cybernetic Socialism

Stafford Beer, a British management theorist, is the second figure in this trajectory. As a child, he famously made his younger brother sign a contract promising not to use the name “Stafford” so that he could be the only “Stafford Beer.” That eccentricity foreshadows the large ambitions of his work.

Beer is best known for the line:

> “The purpose of a system is what it does.”

In other words, a system’s purpose is revealed by its outcomes, not by the stated intentions of its designers.

Like Wiener, he starts in anti-aircraft artillery during World War II, then moves into the **Operations Research (OR)** branch of the British Army. OR grew partly out of the tradition that runs from Charles Babbage to early digital computing. It applies mathematical and statistical methods to practical wartime problems.

Typical OR successes in WWII include:

– Refining anti-aircraft calculations so that far fewer shells are required to bring down a plane.
– Analyzing data to discover that black-painted planes are much easier to spot from submarines than white-painted ones, leading to operational changes.

OR is thus a mixture of data analysis, modeling, and experimental method.

After the war, Beer reads Wiener and begins to apply cybernetic concepts to corporate organization. At United Steel, he develops **management cybernetics**, modeling companies and their environments as interlinked feedback systems. His diagrams feature black boxes, randomizers, and conditional probability registers: structures that take in noisy inputs and produce controlled outputs while hiding their internal complexity. The "black box" becomes a central metaphor for simulations in general—inputs and outputs are visible, but interior workings are opaque.

Cybersyn: A Socialist Opsroom

Beer's most famous project is **Cybersyn** in Chile. In 1970–71, Chile's newly elected socialist government under Salvador Allende invites him to apply cybernetics to the national economy. The initiative is triggered by the economic minister, who has read cybernetic theory and wants to build a command-and-control system that avoids the extreme centralization and bureaucracy of the Soviet model.

The question is whether a **decentralized cybernetic system** can maximize production while preserving workers' autonomy. Cybersyn is the attempt to answer that question.

Chile has almost no computers—perhaps four usable machines in the entire country—so Beer cannot build the distributed digital network he imagined. Instead, he links a small number of mainframes to a nationwide network of **telex machines** installed in state-run enterprises.

The architecture is roughly:

– Factories and plants send production data via telex to a central computer.
– A team in a futuristic **Opsroom** (designed by interface designer Gui Bonsiepe) monitors aggregated indicators on large wall displays.
– Rather than issuing detailed commands, they send synthesized information and alerts back out to the factories, where workers and local managers make decisions.

Cybersyn is designed to be **anti-technocratic**:

– The Opsroom is meant as a monitoring and coordination hub, not a top-down command post.
– It aims to reduce bureaucratic lag and support worker participation rather than create a new caste of cybernetic overlords.

Beer initially takes on Cybersyn with a degree of hubris—finally a national-scale canvas for his ideas after the constraints of corporate consulting. But he is politically radicalized by the Chilean revolution, becomes a committed Trotskyist, and struggles with the tension between his grand designs and the skepticism of Chilean socialists who find some of his political views naïve.

The Truckers’ Strike and a Stay of Execution

In **October 1972**, amid rising tensions and covert interference by the CIA, Chile faces a massive **truckers’ strike** (sometimes called the bosses’ strike). Many independently owned truckers, supported by business associations and foreign funding, attempt to paralyze the economy by refusing to move goods and food.

This is a logistical attack on the socialist government. Cybersyn is brought into action:

- The telex network sends updates on shortages and blockages.
- The central Opsroom generates a bird’s-eye view of the logistical system.
- The team uses this model to reroute trucks, reprioritize shipments, and help keep the country functioning despite the strike.

Members of Allende’s administration later argue that without Cybersyn, Chile might have collapsed on or around October 17th, 1972—the same date associated in popular memory with the Uruguayan Andes plane crash, where a rugby team survived by resorting to cannibalism. The two events are not directly related but share a sense of crisis and improvisation under extreme conditions.

Cybersyn gives the revolution a **stay of execution**, not a pardon. In September 1973, a CIA-backed coup led by Augusto Pinochet overthrows Allende. As tanks approach the presidential palace, Allende orders his comrades to evacuate and then kills himself in his office with a rifle gifted by Fidel Castro, rather than be captured. Pinochet’s dictatorship proceeds to massacre and “disappear” thousands.

It is tempting—if not entirely accurate—to frame this as a clash between two embryonic internets:

- ARPANET, emerging in the U.S.
- Cybersyn, a socialist information network in Chile

In that story, the CIA cannot tolerate a “socialist internet” that demonstrates real logistical capacity against imperial interests. The reality is more complex, but as a narrative device it highlights the stakes of simulation and information infrastructure in Cold War politics.

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Jay Wright Forrester and System Dynamics

Jay Wright Forrester is the third figure in this lineage. He links the military cybernetics of Wiener and Beer to urban planning and global environmental policy.

Forrester works at MIT from the mid-1930s to the late 1980s. Early in his career he:

- Helps develop core memory (RAM).
- Oversees some of the first graphical computer displays, including a line-art Esquire pin-up encoded as vectors.
- Programs what is often cited as the first computer animation: a simple bouncing ball on an oscilloscope.

His major wartime project is **Whirlwind**, a real-time computer designed to:

- Receive vast quantities of radar data.
- Process it quickly.
- Generate interception information for aircraft and missiles.

Whirlwind evolves into **SAGE** (Semi-Automatic Ground Environment), a continent-scale air defense system connected to the distant early warning line in northern Canada. SAGE is another proto-internet: a network of mainframes and consoles coordinating human operators and radar installations.

From Air Defense to Urban Dynamics

Forrester then transfers the logic of cybernetic feedback and real-time monitoring into social systems. Building on management cybernetics, he develops **system dynamics** and applies it to cities in **Urban Dynamics** (1969).

Urban Dynamics models a city using stocks and flows:

- Housing
- Jobs
- Population segments

linked by about 150 equations and 200 parameters. It treats the city as a dynamic system whose behavior can be simulated over time.

The book’s conclusions are very much of their period. It argues, in effect, that:

- Poor people and government spending on their needs can act as drag on the urban system’s “performance.”
- Policies like public housing and welfare sometimes appear in the model to worsen overall conditions.

Politically, this aligns with emergent neoliberal critiques of postwar welfare states. Technically, the book introduces a way of compressing a messy urban world into a manipulable model.

World Dynamics and Limits to Growth

Forrester then scales up further. Working with the **Club of Rome**, he develops a world model that becomes the basis for *The Limits to Growth* (1972):

- A set of simulations exploring Earth’s carrying capacity, population growth, resource depletion, and pollution.

The report echoes older Malthusian anxieties about overpopulation, often landing on:

- The need to limit reproduction, especially among poorer populations.

It is also part of a genuine environmental awakening. Yet it remains technocratic, positing a top-down role for modelers and planners in steering the planet.

Together, Urban Dynamics and Limits to Growth show how simulation moves:

- From WWII air defense
- To corporate management
- To urban planning
- To planetary governance

The structure is always: choose a world, compress it into a model, then act through that model via an interface (graphs, outputs, scenarios).

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Will Wright and Simulation as a Medium

Will Wright, the game designer behind SimCity and The Sims, is the fourth “weird guy” in this story. He embodies the feedback loop between technical simulation and popular culture.

In the early 1980s, Wright is into cross-country road races—driving from New York to California in competitive events—and into programming. He works on **Raid on Bungeling Bay**, a game where you pilot an aircraft and bomb enemy bases. To build the game he creates an internal **level editor** to design island layouts.

He finds himself more interested in the editor than in the game itself. That tool becomes the seed for **SimCity**. At the same time, he reads Forrester’s **Urban Dynamics**, recognizing in it a ready-made logic for simulating cities.

Where Forrester takes cybernetic ideas and applies them to real cities, Wright takes those ideas and loops them back into digital entertainment. Forrester's simulations, in turn, influence the Club of Rome's *Limits to Growth*, which shapes environmental discourse. Wright's work plugs that entire lineage into the home computer.

SimCity and the Possibility Space

In a 2001 GDC talk called "Dynamics for Designers," Wright describes simulation as designing a **possibility space**. The designer:

- Specifies initial parameters, rules, and relationships.
- Lets emergent behavior arise from those rules.

The possibility space is the set of all states the system can reach. The thrill for both designer and player is exploring that space.

Wright discusses techniques like:

- **Monte Carlo sampling**: throwing random "darts" at the possibility space and observing what happens in each state.
- State spaces and trajectories, drawing directly on system-dynamics concepts.

SimCity's core mechanic is balancing three zone types—residential, industrial, commercial—directly derived from Urban Dynamics. Crises appear as feedback loops between simulation variables: crime, pollution, land values, and so on.

A notorious example is **Magnasanti**, a SimCity 3000 savegame created by Vincent Ocasla. He optimizes the city to achieve permanent equilibrium:

- Population and city value remain constant indefinitely.
- There are no apparent crises.

He does this by:

- Eliminating spending on health and education.
- Spending nearly everything on police.
- Designing a city with no roads, so citizens rarely move.

The result is a **homeostatic hellscape**:

- Short lifespans (around 45 years).
- No hospitals, no schools, omnipresent policing.
- A city that functions like a prison, yet is judged "successful" by the game's metrics.

MoMA eventually collects Magnasanti as a conceptual artwork. It crystallizes a key tension: simulation rules, derived from ostensibly neutral cybernetic models, can encode political assumptions that reward dystopian outcomes.

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Critical Simulations and Artist Practice

From here, contemporary artists and designers pick up simulation as a critical medium.

Paolo Pedercini / Molleindustria

Paolo Pedercini, working under the name **Molleindustria**, makes games that foreground their own politics. **Democratic Socialism Simulator** casts the player as a Bernie-like U.S. president after the failures of Sanders's 2020 campaign.

The interface mimics Tinder:

- Policy proposals appear like cards.
- You swipe left or right to accept or reject them.
- At the bottom, stakeholders (capital, climate, working class, etc.) react to your choices.

As you govern, you try to avoid being overthrown in coups or collapsing under crisis. Other titles like **Green New Deal Simulator** and a **New York Times simulator** extend this approach: openly ideological but mechanically rigorous simulations of contemporary politics.

Ian Cheng and Needs-Based AI

Artist **Ian Cheng** builds "live simulations"—works that run continuously over the course of an exhibition and never fully repeat. He draws on Will Wright's **needs-based AI** from The Sims.

In needs-based AI:

- Each agent has needs (hunger, fun, energy, social, etc.).
- Environmental objects satisfy particular needs (a toaster satisfies hunger).
- Agents choose actions based on their most urgent needs and available satisfactions.

The Sims is essentially an ecology of such agents and affordances. Emergent behavior arises from simple local rules.

Cheng uses this model to construct narrative worlds where:

- Characters have needs and drives.
- Situations unfold as a result of those interacting needs.

The result is a form of narrative that is neither fixed script nor pure randomness, but a stable yet surprising system.

My Own Experiments: Needs, Objects, and Economics

In my own work, I've been exploring both needs-based AI and economic simulation.

One thread asks what happens if the needs-based model is extended beyond human or anthropomorphic agents. In The Sims, only Sims have needs; environment objects are passive satisfiers. But object-oriented ontology suggests that objects and infrastructures also have agencies and "needs." A simulation where chairs, buildings, and institutions have needs and strategies would challenge player assumptions about who or what is central.

Another thread is a **Google Sheets economic simulator**, inspired by Marxist economics and Stafford Beer's systems thinking. In it:

- Basic constants (number of workers, hours worked, living wage) define total labor hours and wage bills.
- Surplus, profit, and other derived values are calculated on top.

Changing one base input cascades through the model, revealing dialectical tensions between wages, profits, and production. Conceptually it is satisfying; visually, it lacks the compelling interface of a SimCity, which raises the design challenge of how to visualize such systems in more engaging ways.

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Afterword: Extensions and References

In discussion after the presentation, several connections and references emerged that extend this framework.

One strand links this history to anthropological and psychoanalytic theories that also use systemic metaphors: Freud and Lacan's psychic economies, Margaret Mead's role in early cybernetics and communication theory, and Cold War anthropology funded by atomic agencies to "prove" humans are inherently aggressive, thereby justifying first-strike strategies.

Another strand points to artists and theorists who collage or critique these systems:

- Craig Baldwin's film *Tribulation 99: Alien Anomalies Under America* is a conspiracy collage that weaves CIA interventions in South America into an alien narrative, echoing the paranoid logic of Cold War simulations.
- Long-form audio projects like *Elephant Graveyard* adopt radio-show formats to layer Jungian psychology, conspiracy, and dark humor, critiquing Joe Rogan-style productization and eugenic thought through absurd personas.

Philosopher **Manuel DeLanda**'s *War in the Age of Intelligent Machines* offers another crucial bridge, tracing how military simulations and command-and-control systems produce new forms of autonomy and "intelligence" in machines. His lectures at the European Graduate School unpack Deleuze in accessible ways, emphasizing material flows and emergent structures.

Other references include:

- Benjamin Labatut's novels, such as *When We Cease to Understand the World*, which fictionalize scientists compromised by their involvement in war and state power.
- Jeremy Campbell's *Grammatical Man: Information, Entropy, Language, and Life*, a classic overview of cybernetics and information theory.
- The **Serving Library** and its precursor magazine **Dot Dot Dot**, which collect essays on randomness, color, Chomsky, and cybernetics, all attentive to how graphic design and typography shape meaning.
- Artist practices by Mark Leckey and Ryan Gander, whose lecture-performances and speculative TV proposals (like Gander's *Loose Associations* and *Index TV*) resonate with this kind of associative, research-driven storytelling.

Taken together, these references situate Wiener, Beer, Forrester, and Wright within a much broader ecology of systems thinking, paranoia, and aesthetics. Simulation emerges not just as a technical tool but as a cultural form: a way of imagining worlds, compressing them into models, and wrapping those models in interfaces that make some futures feel inevitable and others impossible.

The challenge—and the opportunity—for artists and designers now is to open those black boxes, to surface the assumptions embedded in our simulations, and to treat "world → model → interface" as a shared, contestable design language rather than a hidden backend.

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If you'd like, I can next help format this as a zine or booklet (section titles, pull-quotes, image suggestions) or adapt it into a shorter talk script with timed beats for slides.