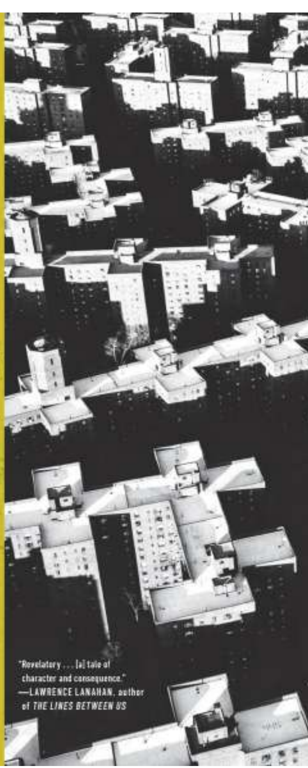
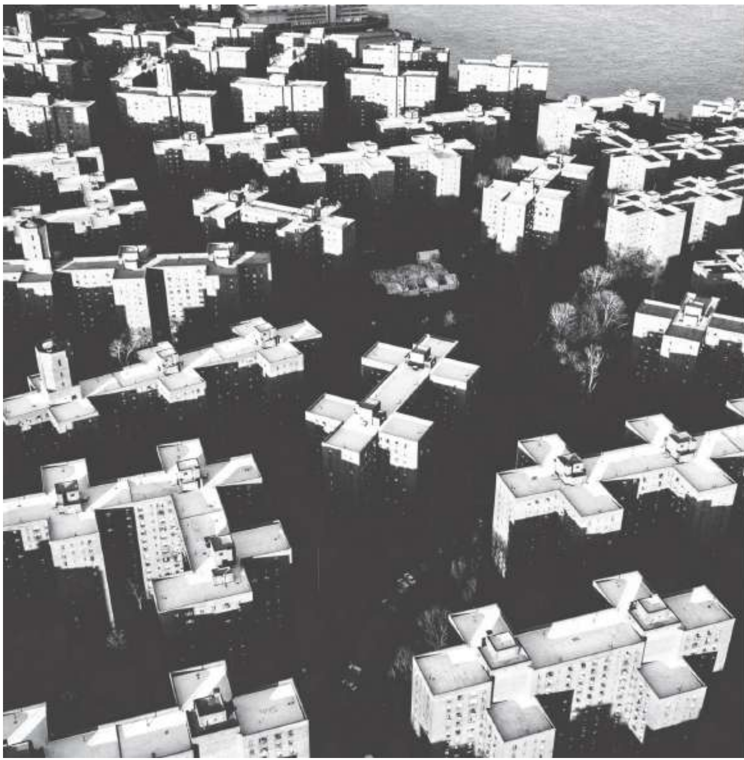

JON ADAMS AND
EDMUND RAMSDEN
RAT
CITY
OVERCROWDING
AND URBAN
DERANGEMENT
IN THE RODENT
UNIVERSES OF
JOHN B. CALHOUN
"Revelatory . . . [a] tale of
character and consequence."
—LAWRENCE LANAHAN, author
of THE LINES BETWEEN US

RAT
CITY



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RAT CITY

OVERCROWDING AND URBAN DERANGEMENT IN THE RODENT UNIVERSES OF JOHN B. CALHOUN

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RAT CITY: OVERCROWDING AND URBAN DERANGEMENT IN THE RODENT UNIVERSES OF JOHN B. CALHOUN

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“Where once were hardly solitary cottages, there are now large cities … everywhere are houses, and inhabitants, and settled government, and civilized life. What most frequently meets our view (and occasions complaint), is our teeming population: our numbers are burdensome to the world, which can hardly supply us from its natural elements; our wants grow more and more keen, and our complaints more bitter in all mouths.”

TERTULLIAN, C. 200 AD

“If we could solve all the rat problems we would be well on the way to solving many of the critical issues facing mankind today. Perhaps we just might better quit looking directly at ourselves for a while, and instead look at rats to see what that avenue of searching tells us about ourselves.”

JOHN B. CALHOUN, 1967

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PRIMATE CITIES

This is the house that Jack built.
This is the malt
That lay in the house that Jack built.

This is the rat,
That ate the malt
That lay in the house that Jack built.

ENGLISH NURSERY RHYME, TRAD.

SOME six hundred and ninety thousand people live within the nineteen square miles of the Edogawa ward of Tokyo. That's a population density of over thirty-six thousand people per square mile. Approximately one in every seventy of those never leaves the house. Nationwide, it is estimated there are over a million and a half people living like this. Nearly all are housed with families, although most do not socialize with them. The family home is a place of purely physical sustenance, and almost total psychic withdrawal.

In Japan, the housebound are called the *hikikomori.* Shut-ins. Isolates. Practitioners of a modern and distinctly urban form of eremetic monasticism. No one is quite sure what causes this, or why it is happening now. But the phenomenon seems to be spreading, with similar cases reported in other Asian countries and in the West, where the trope of young men holed up in their parents' basements has become a chat-board cliché. The Japanese population is shrinking, with birth rates falling as fewer and fewer young people form relationships. More and more hikikomori are reported each year.

John B. Calhoun died in 1995, but he would have recognized the hikikomori. Complete social withdrawal was a typical response to overcrowding in his research, one of a suite of behaviors that emerged under conditions of elevated population density. His term for this particular reaction was "social autism." Other typical responses included aggression, gang formation, and obsessive communal eating and drinking.

Jack Calhoun, though, had not been studying human societies, but colonies of rats.

He had first begun his work with crowded rodents in the 1940s, fencing off a clearing in the woods behind his house. By the 1970s, his rats were living in large, elaborate enclosures within the animal houses of the National Institute of Mental Health, better known by its acronym: NIMH. Calhoun had lobbied long and hard to have special facilities in which to conduct his experiments. His colleagues affectionately called his lab "the house that Jack built."

Inside were the rat cities of NIMH. Calhoun called them "universes" because they were self-contained environments, worlds unto themselves, where all of the somatic needs of the rats were met. Unlike a laboratory cage, which is designed to pacify and contain the occupant by isolating it from others, Calhoun carefully designed the enclosures to allow his animals opportunity to exhibit their natural social behaviors. They were designed to create "rat utopia," and, just as in the wild, the rats formed colonies and raised families. They had abundant food, water, and bedding, plenty of nest boxes. And, until the populations reached a certain size, they had enough space.

But when population density increased beyond a certain point, the social fabric began to unravel.

In the second and third generations, as the rats' universe became increasingly crowded, abnormal behaviors began to emerge in the rat cities. Fertility rates dropped; infant neglect rose. The usual mating rituals were abandoned and replaced by aggressive and persistent nonreproductive sexual activity. Homosexuality became commonplace. Violence, which among animals of the same species is nearly always ritualistic and seldom causes any serious damage to combatants, became endemic. Rats in the wild merely nip one another, but in Calhoun's animal houses, those rules ceased to hold. The rats of NIMH deployed the full force of their jaws, using slashing motions to penetrate through skin and muscle, leading to disembowelment and tail amputation. Private burrows were invaded, and the young nested within were cannibalized. Rat utopia became hell.

Complete social withdrawal became a survival strategy. The isolates, Calhoun's hikikomori, were sleek and glossy, well fed, calm, docile. They often stayed high above the floor of the pens, avoiding the violence and sexual activity rampant below. Calhoun had a name for them: *the Beautiful Ones.* From an evolutionary perspective, their existence was baffling: "For their whole life span they failed to reproduce," he marveled. "They might as well have died at birth."

Eventually, social disruption was so severe that no new young survived past infancy and reproduction ceased altogether. The colonies depopulated toward zero. The trauma was intergenerational: even when individuals born in the later stages of the experiment were removed from the universe and placed in more comfortable surroundings, they failed to develop any of the normal behaviors and produced no viable offspring. From 1947 until 1983, Jack repeated variations on his experiments, tweaking variables, trying to find a strategy by which the rats could survive overcrowding. Each iteration terminated in colonial extinction, the sterile and hermetic Beautiful Ones, asocial hikikomori, always the last survivors.

Jack Calhoun lived through a period of massive population growth. At his birth, in 1917, the global population was a little under two billion. By his death, it was almost six billion. Today, it is in excess of eight billion. Demographers studying that trend discovered that the human population was growing exponentially, each doubling occurring in half the time it had taken for the previous doubling. In 1960, one scientist playfully calculated that, if this continued, the human population would approach infinity on Friday the thirteenth of November, 2026.

Calhoun was trying to find a way to solve the problem of crowding. He didn't believe it was possible to halt population growth—or rather, he felt that the possible routes were impossibly undesirable. Through studying rodents, he wanted to find out if and how humans might cope when social density in the cities approached the densities in his universes.

—

WHEN NEWS of Calhoun's work first emerged in the early 1960s, it was into a culture undergoing huge social upheaval. Inner-city rioting, motiveless serial murder, sexual deviancy. As an explanation, crowding seemed to fit the data. Colloquially, we are well aware that crowded places are stressful. It's entirely familiar today to say something like "I get stressed when people intrude on my personal space" or "crowded places get my adrenaline going." But actually, these are all quite recent ideas. The link between adrenaline and stress was only discovered in the 1910s, the term "stress" itself only arrived in the 1930s, and "personal space" wasn't a thing until the late 1950s. "Stress" and "personal space" and "the fight-or-flight response" were concepts that emerged from researchers who, like Calhoun, were studying how humans and other animals negotiate social relations and defend territory.

Some of them were architects, or anthropologists, or psychiatrists. Many were ecologists. Nearly all used animal studies to inform and explain their work. In applying what they had learned about animal behavior to the study of human society, startling continuities became apparent. Stress caused by proximity to others caused all manner of problems. When Jean-Paul Sartre wrote "*L'enfer, c'est les autres*"—hell is other people—it was in the context of a play where the characters were unable to leave the room.

Calhoun's work helped people think about how the design and layout of a room might change the experience of people within it. Psychiatrists studying the behavior of mental patients on open wards realized that in addition to whatever else was wrong with them, the patients were also stressed by unwanted and constant social contact. They felt vulnerable, exposed. Simply by putting up screens to break up lines of sight in large spaces, or rearranging the chairs so people didn't have to face one another, they were able to make their patients feel more comfortable.

We all put up screens. A wall is a screen, or a closed door. On a crowded subway train, a newspaper is a screen, or a book. A screen is a screen, too. The electronic devices we carry block the need for social engagement, reduce the risk of eye contact with strangers. In crowded places, we retreat behind them, a black mirror held up to the world without. Such distractions are necessary: the city can be a uniquely uncomfortable habitat in which to live.

The rat cities of NIMH were models of our own cities: places in which unwanted contact with strangers forced withdrawal or confrontation, where the pursuit of privacy would vie with the need to connect. The global trend toward urbanization over the last century and a half has seen an ever-greater proportion of an ever-larger global population living in ever-denser agglomerations. A physicist in the 1940s watching the seemingly inexorable concentration of people drawn into the urban core described the phenomenon as "demographic gravitation."

In most countries, city size follows a curious power law, whereby the largest city is twice as populous as the second largest city, and the third largest city a third as populous, and so on. But in some countries, there is one city much larger than any others. Dublin is five times more populous than Cork; Kabul is more than eight times the size of Kandahar; while in Ethiopia, Addis Ababa is almost ten times larger than Adama. Phnom Penh is fifteen times larger than Cambodia's second city of Siem Reap. Almost ten percent of the population of Japan lives in Tokyo, where the hikikomori wait out their quiet lives. Geographers have an odd term for such places. They call them "primate cities." There are relatively few primate cities.

But every city is a rat city. Wherever there are people, there will be rats. Like us, and because of us, they have become a global species. Of all the continents, only Antarctica has no rats. But it also has no cities. The largest inhabited area that has managed to eradicate rats is the sparsely populated Canadian province of Alberta, and only by dint of vigilant rodent control, abetted by sufficient peripheral wilderness. New Zealand hopes to replicate this feat by 2050.

It was rodent eradication that first drew Jack Calhoun from rural Tennessee to inner-city Baltimore, where he was enlisted to help combat a wartime rat infestation. His story is the spindle around which all else is organized in this book. But telling his story requires following the rat from the baiting pits of Victorian London to the pristine laboratories of Johns Hopkins and on to the rat cities of NIMH. It involves the emergence of ecology and ethology, and how these new sciences led to new ways of thinking about the place of humans both in relation to other animals and to the habitats we have built for ourselves.

Habitat matters. Darwin's theory of evolution established that the physical form of an organism reflected its adaptation to a particular habitat. Calhoun came from a school of thought that emphasized how behavior, too, was adaptive, and that what sorts of things an animal did—whether it gathered in packs or lived alone, whether it built nests or dug burrows—were also adaptations to particular habitats. And so, while his colleagues performed experiments on animals kept in standardized cages, Calhoun experimented with different cages and left the animals themselves alone. What sort of box you kept an animal in would affect what it did.

In the early 1970s, Jack Calhoun was briefly famous. His work was regularly featured in the press; he was consulted by the United Nations, introduced to the Pope, and even put forward for the Nobel Prize. By the 1980s, as the focus of mental health shifted away from environmental causes and toward pharmacological fixes, his scientific stock value began to decline. Meanwhile, a growing queasiness over the social and political ramifications of "population control" meant that the threat of overpopulation largely disappeared from polite discourse, and with it, Calhoun's relevance.

In recent years, as a new generation learns of the striking parallels between his crowded rodents and our urban predicament, there has been renewed interest in the rat cities of NIMH. Much of this is focused on "Universe 25," one of Calhoun's later experiments. Visually arresting and viscerally repellant, Universe 25 has become a shorthand for civilizational collapse. But the actual experiment has receded behind a caricature, become a meme. Universe 25 was the most notorious of his projects largely because it was the most photographed. But it was only one of a series of different research cycles, each exploring an issue raised by the previous cycle. And each linked in an intellectual trajectory he pursued assiduously over four decades.

Calhoun was aware of the macabre appeal of his work and sought to use the press attention to try to spread his optimistic and increasingly urgent message that humanity need not endure the same fate as his rodents. That positive message has largely been lost, and to date no full account of his scientific career has been written. This book is an attempt to fill in the history leading up to Universe 25 and beyond. Ours is not an attempt to evaluate the merit of his work, but simply to set the rat cities in their scientific and historical context, and to answer the questions they raise: Why did he create his strange model universes? Why did he use rats? And what did he and others think a pen full of swarming rodents really told us about life in our human cities?