Cryptographic City

Decoding the Smart Metropolis

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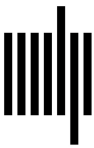

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14 Closure: The Urban Cryptanalyst

> If someone figured out my secret 4-digital PIN then I would really be in trouble. They'd have my bank PIN, could access the door to my office, and get into my smartphone. Worst of all, they would know the year of my birth!
>
> —Adapted from https://upjoke.com/code-jokes

Codes are ubiquitous. I hope that I have been able to demonstrate that cryptography is a major element in the contours of any city, delineated by technologies, instruments, and processes for hiding and revealing information, messages, things, spaces, places, and people. Cryptographic devices are built into the forms, organizational arrangements, framings, myths, and metaphors of the city. The tenets of cryptography align with theories about cities. In this book I have expanded on the cultural aspects of cryptography and the city. Cryptography is as old as secrets. Society could not function without secrets, and that sustains our curiosity. Whether or not we invent, code, and maintain encrypted systems, we urban inhabitants are unintentional codebreakers constantly seeking out meanings and how to interact with the city, which is to say to interpret our world.

I grouped the discussion in this book under four headings. The first made the case for an urban cryptology, with an emphasis on cultures of writing. The second introduced the combinatorial aspects of making, writing, and reading the city. The third delved into algorithms and calculations. The fourth examined some of the outer limits of cryptographic operations.

The Case for an Urban Cryptology

Some architects have drawn on the mystique of esoteric symbols and numbers for inspiration and catered to the requirements of secret societies. I

identified key affordances of cryptography: to reveal and conceal, combine and enumerate, originate and navigate, activate and transact, engender risk and trust. My purpose here was to collate the most obvious cases where architecture and the city are inscribed with coded messages in stone, concrete, and steel before pursuing the less obvious connections with cities in the rest of the book.

The history of writing and print is relevant not least as it implicates encryption as a process of rearranging letters in movable type. It is also a touchpoint for architecture and urbanism through the innovative cryptographic apparatus (the cipher wheel) of Leon Battista Alberti. Alberti's cipher wheel and his influence in architecture and urbanism entitles architecture to claim a pivotal place in the history and theory of cryptography, and hence as custodian of the cryptographic city. Understood through sign systems and semiotics, appropriately designed places provide the means of their own decryption. Place is the code, a proposition supported by concepts of *affordance* from environmental psychology and media studies.

Urban Combinatorics

Cities are places of combination and recombination. The theme of combinatorial complexity led me to review the nature of riddles, jokes, and puzzles to furnish explanations of city affordances. To view the city through the lens of cryptography is to see the city as a spatial puzzle. Labyrinths provide a further leitmotif and metaphor for the cryptographic city's infrastructural complexity. Digital platforms and programs that find routes and navigate through cities and problem spaces are commonly tested with networks shaped like branching labyrinths. Much digital simulation of city functions and spaces invariably involves disguise, dissimulation, a kind of play function.

Cryptotechnics

Cryptocurrencies offer high-profile, disruptive, and far-reaching examples of applied cryptography. Attention to cryptocurrency and the blockchain emphasizes the consequences of this investigation into the cryptographic city, not least the central role of transactions involving money. A city is also an array of locks, keys, vaults, hidden spaces, security doors, cameras, contactless sensors, keypads, passcodes, biometric IDs, and face

recognition—fixed and mobile. Under the blockchain metaphor, cities reveal themselves as hyper-encrypted and hashed (a kind of recombination), and the city depends on that.

I examined encryption methods that pertain to images. The city as a collage suggests time-bound and dynamic interactions between erased, hidden, and fragmented layers. Steganography as a branch of cryptography operationalizes certain aspects of hidden layering. This introduced the concept of the hash string, ubiquitous in encryption methods, as a kind of signature. I examined the methods behind image compression, authentication, the specialized procedures of hashing, hashes of hashes, chained hash strings, and proof of work, as the bases of blockchain and other encryption techniques in the cryptographic city.

Cryptography at the Limit

Cryptography belongs within tactics of obfuscation and espionage—urban tactics deployed by state instruments, corporations, activists, and day-to-day creators and users of information. Obfuscation enters the field as a major element in cyberattack and cyber defense strategies within cities.

I examined the nature of algorithms and hidden variables as vehicles for covert messaging. The term *hidden dimension* is architecturally alluring as it implies there are spatial parameters that extend beyond our usual experiences of a place or are accessible only via specialized inquiry. The exposure and manipulation of a city's hidden dimensions is emblematic of social and digital processes in the cryptographic city. The challenges offered by cryptographic communications at the nano (DNA) and interstellar scales emphasize the scope of cryptography's claims on the physical world. Putative extraterrestrial communication attempts to provide the means of decoding in the coding mechanisms themselves, offering instrumentalized support for the idea of urban affordances. Developments in quantum physics expand further the human enchantment with alternative universes and secret realities: the cryptographic city as experienced and imagined.

The Accidental Cryptographer

My arguments presented four main claims about urban cryptography. First, was the obvious claim that cryptography provides a way to address and

solve some of the challenges of data security and information flows in the city. I have left it to others to advocate for vigilance in adopting appropriate security practices. The second claim was that people, objects, and information hide in cities. By inspecting the city through the frame of cryptography, we understand better the hidden aspects of city life and form. In this case cryptography provides a pretext for talking about urban hiddenness. Third was the claim that cryptographic processes mirror and inform what happens in the design, management, and use of city elements and spaces not least through the idea of the city as a process of combination and recombination. Fourth, the challenge of cryptography in the city is less a problem of coding and hiding as decoding and exposing. *Accessibility* is the watchword of contemporary urbanism: laying bare and revealing rather than hiding things away.

I have emphasized cryptography in the conceptual framing of the city. Urban researchers have conducted similar exercises through diverse framings: the city through the imagination, utopia, night life, walking, skateboarding, seasons, light, color, the transhuman, wellbeing, disadvantage, division, contest, efficiency, prosperity, and smartness. Each framing sheds light on different facets of the city—and a city is surely multifaceted. Each also occludes other aspects of the city not accommodated in any particular framing.

What does a conceptual framing of the city as *cryptographic* reveal and conceal? It reveals the city as a site of secret societies, pervaded by the remnants of a less-familiar past, of affordances encoded into artifacts, a place of writing, forensics, puzzles and combinations, labyrinths, underground places, disguises, ubiquitous covert communications and transactions, barter and unregulated commerce, clandestine imagery, espionage, algorithms, hidden dimensions, and parallel existences. As indicated by the naming of the *cryptographic* city it exposes a range of facets of city living, but also admits the inevitability of occlusion, of concealment. Inevitably, this framing emphasizes calculation and technological mediations, while casting the many other varied aspects of urban experience into the shadows, at least for a time.

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