



## Media, Hot and Cold

### ***Introduction: Temperature is a Media Problem***

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Temperature is a media problem, or so we are told by the United States Supreme Court. In *Kyllo v. United States* (2001), the Court ruled that the warrantless use of thermal imaging technology to detect marijuana-growing operations contravened the Fourth Amendment. In writing the majority opinion, Justice Antonin Scalia explained that the heat-sensing technology threatened the privacy of the house's female occupants. He wrote:

The Agema Thermovision 210 might disclose, for example, at what hour each night the lady of the house takes her daily sauna and bath—a detail that many would consider “intimate.”

How can we account for Scalia's comments? One analysis might look at the adoption of thermal technologies by police forces and how these technologies are used to diagnose normal and domestic thermal radiation. We could ask how it is that such basic thermal imaging can offend a famously pro-police Supreme Court Justice simply because the radiation of heat is a promiscuous phenomenon that might disclose more than is appropriate. Or we could ask how thermal technologies enter into a complex legal, disciplinary, and gendered semiosis of aberrant heat. A growing number of airports, for instance, use thermal imaging technology to monitor passengers and identify those with elevated temperatures—those who might be sick.

This is the ethos of “Media, Hot and Cold,” this special selection of papers in the *IJoC*, which grapples with the questions implicated by the ever-radiating temperature of bodies, spaces, and things. Beginning with a pun on Marshall McLuhan's famous formulation of hot and cold (and sometimes cool) media, these papers look at the intersections of temperature and media studies, a full 50 years after the publication of *Understanding Media* (1964). We took McLuhan's metaphors perhaps more literally than they were intended in order to argue that the intersection of media and temperature is a significant—if significantly ignored—research avenue in the 21st century.

"Media Hot and Cold" is the title of the second chapter in *Understanding Media* (McLuhan, 1964), sandwiched between "The Medium Is the Message" and "Reversal of the Overheated Medium," the latter being further evidence of the importance of temperature metaphors in his system of ideas. But was it only a metaphor? Certainly, there is nothing actually hot about the waltz, or nothing especially hot about the waltz that would make the telephone seem colder. But at other times McLuhan's toying with temperature tilts away from the metaphorical. He writes, for instance,

Whole cultures could now be programmed to keep their emotional climate stable in the same way that we have begun to know something about maintaining equilibrium in the commercial economies of the world. (p. 30)

McLuhan's blend of systems theory and temperature metaphors makes sense: A climate is a calibrated system, and "equilibrium" in that system is all too fragile. Likewise, cybernetic thought (also enjoying a heyday in 1964) imported the concept of homeostasis from biology, and homeostatic systems require a regulated temperature. Any musician who has tried to tune an instrument knows this. During winter, musicians let stringed instruments heat up to room temperature before tuning them. During summer, increased humidity can also change their behavior. For years, electronic instruments were particularly susceptible to temperature, changing their tuning as they grew hotter from use. Indeed, the first commercial product called Auto-Tune was not the now-ubiquitous voice-adjustment software, but instead a feature that allowed for temperature-calibrated tuning of electronic synthesizers in the 1970s. Western music and its descendants thus assume regulated temperatures in its most basic aesthetics, and today every purchased piece of consumer electronics is accompanied by specific instructions as to optimal operating temperatures. In their most basic operations, media technologies always assume a certain degree of hot and cold.

Temperature is therefore already implicated in many of the fundamental aspects of our media systems. Treating hot and cold as "just" metaphors chills the potential that temperature-focused problematics can hold. This special section follows the conjunction of temperature and media. As conceptions of temperature suffuse our understandings of living organisms, technical infrastructures, or the visualization of data, temperature tempers the discursive formulations around both global catastrophe and meticulous self-management.

Far from suggesting that "temperature studies" ought to exist as a subfield of media studies, this collection of essays pursues how temperature *already* appears as an active problematic in a range of cognate fields. By bringing these research threads together, we are asking: How do we talk about temperature as a vector of research in its own right?

In the simplest sense, temperature is a quality assigned to changes in brute facts: The water is boiling. The water is still. The water is frozen. In turn, these observable states are captured by measurement. Hasok Chang (2004) describes how the "invention of temperature" was no less than the fixing of water's three states to one particular scale. Temperature is also a means of describing the subjectivity of sense experience. John Locke employed his lukewarm-bucket-of-water experiment to argue that heat was not a property of water, and used it as a basis for distinguishing primary and secondary

qualities (1690/1959).<sup>1</sup> These three dimensions of temperature—fact, measurement, and experience—and the inextricable links among them, return throughout the texts in this collection, although these authors are able to move far beyond the mundane attributes of water.

### Contributions

One stream of work in this issue offers both definitions of temperature and a history of attempts to understand it. As Nicole Starosielski writes, “Temperature is a mode of environmental description attuned to the speed and rhythm of movement, the densities of substances, and their sensory effects.” Building on this definition, Starosielski details four ways that temperature animates communication and media studies: the taking of a medium’s temperature, the conductivity of particular media and communications technologies, the analysis of phase transitions, and as a material property and product of media ecologies. As the other contributions to this volume illustrate, Starosielski’s typology offers a robust map for future work on temperature and media.

In their contributions, Brent Malin and Alice Christensen describe a blooming of 19th-century temperature research in psychological, physical, and psychophysical experimentation. Malin traces the 19th- and 20th-century trajectory of the science of emotions, beginning with the Italian scientist Angelo Mosso, whose self-probing connected his temperature to his emotional state. Malin describes the intertwined relationship of temperature and media technology research in psychology by tracking twinned processes: the “overheating” of citizens through information overload and the “cooling” of researchers, whose appropriation of media technologies enabled new kinds of rationalization. Christensen reveals that Ernst Weber’s (1846) foundational work in psychophysics started with Weber’s investigations into the sense of touch and temperature. Before bodies were considered sources of light and sound in their own right, Weber reckoned with the implications of a human body that is always its own kind of thermometer.

The weather channel, as the crystallization of a particularly familiar fusion of temperature-media, forms the backdrop of our most ordinary socializing (Sturken, 2001; Vincent, 1997). For countries where extreme temperatures are part of daily life, weather forecasting and weather talk can become part of the national or regional character (Berland, 2009). Against this ordinary backdrop, however, climate change and its capricious consequences are seemingly the inevitable outcome of planned obsolescence and waste. In the early 21st century, weather and temperature are the material grounds of our eschatological hypotheses, with visualization and data conversion software acting as the means of grappling with these hypotheses. Jody Berland compares cold weather to noise: “Bad weather is weather that makes itself audible, that introduces noise to the body’s interface with the world, that threatens to demolish the discipline of everyday routine with no reason or need to explain” (2009, p. 241). Certainly natural disasters and climate change are reminders of human hubris and the limits of our agency, but as Berland suggests, so too is every freezing winter and scorching summer.

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<sup>1</sup> Put one hand in a bucket of hot water and the other in a bucket of cold water, then move them both to a bucket of lukewarm water. One hand will register as hot, the other as cold. Locke argues this showed that the idea of heat could not reside *in* the water, like shape or size could.

Another stream of contributions to this issue takes up questions of temperature representation and its effects. Lisa Parks describes how reading temperature—*pace* Justice Scalia—is now a precondition for decision making for military and law enforcement officials. Drained of the “visible light indicators” of race, class, and gender, drone-mounted infrared sensors have codified and re-stratified the “visible” world through the detection and classification of body heat. Marita Sturken, who coined the term “weather media” more than a decade ago (2001, p. 163), describes the representational politics of coloring the world according to temperature fluctuations. Sturken identifies a trajectory from community weather watchers, to Doppler radar images, to satellite data, and finally, to the self-representation of being in weather archived in social media. Rafico Ruiz’s “Iceberg Media” chronicles the new industrial attempts to track, transport, and harvest icebergs. As the products of deteriorating polar regions, icebergs are a danger to shipping lanes, while at the same time they represent a potential supply of potable water; as such, they operate at the nexus of new communication infrastructures, emerging markets, and environmental collapse.

The language of temperature has long structured how we stratify space and the people who occupy space. Sometimes the language is metaphorical, as in English-language depictions of emotion: We lose our cool, we boil with anger, and then we simmer (Lakoff & Kövecses, 1987); or after World War II, when jazz musicians slowed their tempos, played behind the beat, and emphasized melody over phrasing to develop a “cool” alternative to “hot” jazz. Sometimes the language is judgmental or even explicitly chauvinistic, as when Claude Lévi-Strauss designated some societies “hot” (in Western Europe) and others “cold” (non-Western ones) (1991/1995). For other thinkers, mean differences in average temperatures are the grounds for massive social differences: Jean-Jacques Rousseau (1781/1998) argued that language emerged in hot countries as dance and moved to cold countries; Montesquieu (1748/1949) believed that warmer countries were lazy, while cold countries were efficient; and Henry Miller described in *The Air-Conditioned Nightmare* (1945) how heating is a basic comfort and artificial cooling is snobby. Some medieval canonists and theologians believed that sexual difference was a result of temperature difference—men were hot and women cold—and these differences manifested in physical attributes and behavior (Salisbury, 1996). Contemporary research into the connection between temperature and work efficiency applies this style of thinking while burdening it with different political baggage: Cornell researchers (Lang, 2004) adjust office thermostats and conclude warm workers are more productive than cold ones, while NIH researchers fiddle with room temperatures in attempts to quantify and improve sleep quality (Reynolds, 2014). As a focus in a growing area of research on the “science of comfort,” the ergonomics of temperature sculpts workplaces and homes.

In this section, Jessica Mudry brings us her exposition on “the calorie”—a peculiarly contemporary articulation of food, bodies, and exercise—with a hefty history. Mudry reaches back to 18th-century France for the work of Laplace and Levoisier (1780) and their guinea-pig-cum-*calorimetre*, and through 19th-century Germany, where Max Rubner used the calorie “to denote the amount of heat required to raise one gram of water, one degree centigrade.” In spite of (or because of?) its roots in Enlightenment science, Mudry describes the picayune ways the calorie became a means of discipline and self-management.

Temperature is both a friend and foe of media technologies. Freezing old videotapes is a last resort for preventing the ferric oxide from falling off magnetic tape; “baking” audio tapes allows them to

be played one more time for digital capture. The antagonistic relationship between extreme temperatures and consumer technology is turned on its head and turned culinary when freezing information and cooking it become the only way to save and use it. As the physical footprint and profile of home and mobile computing grow smaller and the "cloud" expands, individual users not only outsource data storage, they outsource heat management from their own devices to massive server farms that are hungry for clean air, cool temperatures, and cheap energy. This fact did not go unnoticed by a team of researchers at Microsoft who "argue that servers can be sent to homes and office buildings and used as a primary heat source" (Liu et al., 2011, p. 1). These "data furnaces," the authors claim, would recycle the heat already created by computing to reduce server costs for large tech companies while improving quality of service by "moving storage and computation closer to the consumer" (p. 1).

But heat has long been a limit of computing power. In 1968, Gordon Moore penned his famous essay that predicted that the density of transistors on a chip would increase by "a factor of two per year" (p. 83) (now erroneously called "Moore's Law" and often misquoted). He immediately followed this prediction with a section entitled "Heat Problem," arguing that "the heat generated by tens of thousands of components in a single silicon chip" (1968/1998, p. 84) was an engineering problem that had to be overcome but could be. As Rick Maxwell and Toby Miller write, by 2011 this was no longer the case:

[T]he energy demands of the latest chip generation were reaching the limits of the electrical power supply, while the only way to avoid destructive heat levels was to create a kind of chip, known as dark silicon, on which some transistors were left unpowered while others were running. (2012, p. 28)

At least in the world of consumer computing, today's microprocessors no longer conform to Moore's so-called law. Innovations in processor power for desktop computing now focus on multiple cores, novel cooling systems, and applying coding efficiencies originally developed for mobile platforms.

Heat also shapes the most basic math of computing for media. One of the most important mathematical models in the history of physics and computing is the Fourier Transform—a method for converting signals to frequencies—which began as a theory of heat propagation. There is perhaps no better place to locate the articulation of media studies and temperature than with a mathematical model meant to represent the transformation, exchange, and processing of heat as a substance. This model subtends practically every one of our communication technologies in use today. For instance, every digital sound and video file operates according to the Fourier Transform and its mathematical descendants. In his contribution, Wolfgang Ernst, addresses the "technomathematical condition of present day media culture" through a media-archaeological investigation of the Fourier Transform and the history of signal processing. He offers a reading of the Fourier Transform as a fundamentally sonic phenomenon, framing the history of the separation of signal from noise and the conceptions of time that still shape signal processing technologies today.

In a quote usually attributed to Mark Twain, Charles Dudley Warner, editor of the *Hartford Courant*, wrote that "everybody talks about the weather but no one does anything about it" ("This weather," 1897, p. 8). In this short overview—and in this special section—we hope to make clear that

people are doing things about temperature. Many people are doing many things about temperature: Some hope to manage it, others try to predict it, still others use it to imagine their cultural worlds. Jody Berland begins her chapter on the weather with the claim that it mediates between physical and social bodies. We end our essay by extending her claim. As this issue goes into production, one of us (Jonathan) prepares for doctors to again heat up his body with a heavily regulated radioactive material in a chase after renegade cells—a diagnosis that only exists because of advanced imaging technologies. As in nuclear medicine, so it is in the world in general. Temperature not only mediates between physical and social realms, it is the point at which their difference is at once organized and annihilated.

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