

# what seeps through the pores

by ian spangler

## *I. Meanings.*

Badge of shame and sign of worry, proof of labor into money: sweat spills out of us already filled with meaning. If you break a sweat, stifle it (it's too emotional, you're nervous; it's hot, you're too sweaty). Self-prescribe armpits aluminum-salted deodorant — unless, of course, you've been *working*, in which case you should be *proud* of your sweat. It verifies your investment (in your house, in your body); you've earned value in sweat equity.

Sweat is contextual. Perspiration is epistemic. Sweat isn't actually sweat at all.

There's no shortage of metaphors, turns of phrase, or manners of speaking that make us think about sweat in the abstract — but, despite being one of the most fundamental and ubiquitous expressions of everyday corporeal life, we rarely think of sweat literally. Except, maybe, for how to hide it. How to keep it in.

## *II. The Conference.*

In May 2019, Stanford University's Li Ka Shing Center for Learning and Knowledge hosted its seventh annual Big Data in Precision Health Conference (BDPHC).

Precision medicine combines big data-driven population research with the detection of biofluid analytes to stratify disease into more "precise" subcategories.

The capture and analysis of data is integral, here. As one precision health researcher puts it, "Really what is needed [for human health] is big data."

Another: "By harnessing the vast datasets of biomedical information now available to us... we can prevent disease before it strikes and cure decisively if it does."

*(content warning: this submission contains themes of medical imagery, colonialism, discussions of historical anti-Black racism)*

Aided by data — *bigger data, better data* — disease can be, with military precision, anticipated and eliminated.

### III. The Sensor.

I didn't personally attend the BDPHC. If I had, though, I would have gone to the session on sweat.

"We're trying to make wearable devices that can analyze sweat on the body noninvasively," they said.

Apparently, lots of key analytes of human health swim in our perspiration. Those analytes can be correlated with blood plasma levels to indicate cystic fibrosis, diabetes, and more.

The networked sweat sensor is a deceptively simple, battery-free microfluidic patch, embedded with electrochemical reagents that are networked to a smartphone and report data back in real time.

Despise it though we may, sweat is quickly becoming a bodily fluid *par excellence*.

### IV. The Market.

The networked sweat sensor operates within a booming health tech industry: precision medicine is valued at US\$57 billion as of 2019 and poised to exceed \$110 billion by 2026.<sup>1</sup>

Biosensors alone are expected to exceed \$36 billion by 2027.<sup>2</sup> During the same period of time, global sweat sensor revenues should pass \$2.5 billion.<sup>3</sup>

### V. The Church.

As Shannon Mattern reminds us,<sup>4</sup> "Seemingly everyone is trying to break into the risky but lucrative health tech market." This includes companies like Gatorade, maker of the Gx Sweat Patch and publisher of the most robust literature review of sweat gland physiology to date.<sup>5</sup>

The result of this rat race, as Gina Neff puts it, is to blur the lines between medical devices and consumer goods,<sup>6</sup> which is to say, between medical knowledge and capitalist production.

Welcome to the Church of Sweat and Data: may you achieve health, wealth, and salvation through perspiration.

### VI. New Meanings.

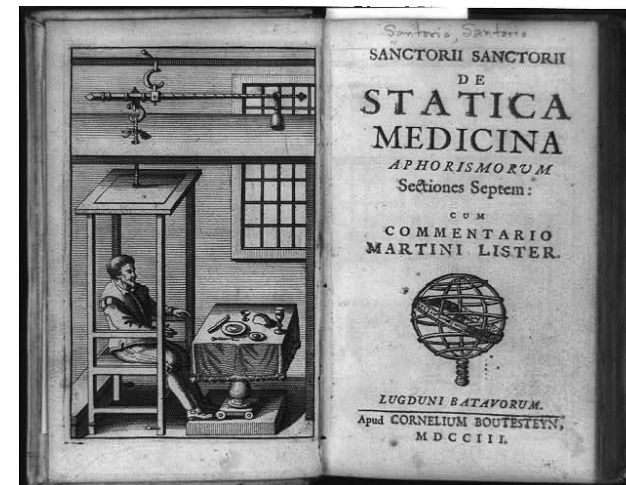
If what we learn from sensing sweat can anticipate our ailments — heal us, even — then sweat must take on a new meaning. It must become an object of medical inquiry.

### VII. Old Methods.

Of course, "sweat as an object of medical inquiry" is not actually a new meaning, and sweat sensing is not actually a new concept. For millennia, medical science has tried to squeeze sweat out, capture it, analyze it — just not always by the same method.

The earliest discussion of sweat can be found in the Hippocratic corpus, which spoke often of rates of sweating and kinds of perspiration. Galen of Pergamon recommended the physician inspect a patient's sweat — even describe its taste. The tongue may have been the first sweat sensor.

Later, in 1614, Sanctorio Sanctorius built a weighing chair. He used it continuously for three decades, weighing himself in relation to his meals and his excretions — an experiment in self-quantification predating the Fitbit by four centuries. In this way, he discovered that we sweat without noticing, which he called *insensible perspiration*.



The weighing chair of Sanctorius, an early technology of self-quantification.

Throughout the 19<sup>th</sup> century, methods to extract sweat became more creative. Some patients were placed in steam baths, their fluids forced by injections of pilocarpine. Others were sweated inside a large rubber bag — “the entire body except the head” — and covered with a hot blanket.

The sweaty body could even be mapped. A patient would be painted with a solution of iodine, castor oil, and alcohol. Left in a heated room to perspire, the first beads would resemble “poppy seeds.” Increasingly, the patient took on shades of “violet-black,” revealing the topography of their perspiration.

### VIII. The Rash.

The two centuries following Sanctorius experienced a remarkable uptick in how Western medical science captured sweat and researched sweat physiology. How can we contextualize this sudden, rigorous interest in perspiration?

It came down to a problem: the production of comfortable infrastructures for colonization.

Sweat rash, a disease that produced anhidrosis and abscesses in its subjects, was cruel to colonizers. Painful vesicles appeared at the mouths of their sweat glands. Pores clogged. For colonization to succeed, it was clear that the problem of tropical acclimatization must be solved. And when the task of eliminating sweat rash fell to medical science, the physiologist became a colonizer; the colony, in turn, became a laboratory.

### IX. The Physician-Colonizer.

In 1744, John Mitchell described the perspiration of “black or tawny people” as “more apt to degenerate into a miasm than the mild effluvia of whites.”<sup>7</sup>

In 1780, Alexander Wilson claimed there was a substance in Black skin that produced a “foul odour.” A few years later, William Cruickshank stated that the “essential oil” of sweat causes blackness and odor in “the skin of a negro.”<sup>8</sup>

In 1799, shortly after claiming that “negroes sweat much less than Europeans,” the physician Charles White writes that the “rank smell emitted from the bodies of many negroes is well known.”<sup>9</sup>

Frantz Fanon once argued that “the French medical service in Algeria could not be separated from French colonialism in Algeria.”<sup>10</sup> Likewise for the new physician-colonizers, whose order of business was to pathologize the sweat of the Black body.

Number	Sex	Age	Height	Weight	Temp. Rect.	Temp. Oral	Temp. Axillary	Temp. Skin	Temp. Head	Temp. Feet	Temp. Hands	Temp. Fingers	Temp. Nails	Temp. Toes	Temp. Feet	Temp. Hands	Temp. Fingers	Temp. Nails	Temp. Toes	Temp. Feet	Temp. Hands	Temp. Fingers	Temp. Nails	Temp. Toes
1	Male	25	5'8"	150	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4
2	Female	20	5'2"	100	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2
3	Male	30	6'0"	180	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6
4	Female	28	5'6"	120	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5
5	Male	35	6'2"	190	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7
6	Female	22	5'4"	110	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.3
7	Male	32	6'1"	175	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5
8	Female	26	5'5"	115	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4
9	Male	38	6'3"	200	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8
10	Female	24	5'3"	105	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2
11	Male	40	6'4"	210	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9
12	Female	27	5'4"	110	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4
13	Male	33	6'0"	170	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6
14	Female	29	5'6"	115	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5	98.5
15	Male	37	6'2"	185	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7
16	Female	25	5'5"	110	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4	98.4
17	Male	42	6'5"	220	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
18	Female	30	5'7"	120	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6
19	Male	45	6'6"	230	99.1	99.1	99.1	99.1	99.1	99.1	99.1	99.1	99.1	99.1	99.1	99.1	99.1	99.1	99.1	99.1	99.1	99.1	99.1	99.1
20	Female	32	5'8"	125	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7
21	Male	48	6'7"	240	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2	99.2
22	Female	34	5'9"	130	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8	98.8
23	Male	50	6'8"	250	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3
24	Female	36	5'10"	135	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9	98.9
25	Male	55	6'9"	260	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.4

Table from Hoelscher's (1899) "A Study in Perspiration," detailing various rates, amounts, and qualities of sweating in "normal individuals."

## X. *The Lecture.*

If the first idea from the colony-laboratory was that Black sweat was pathologically miasmatic, the second was that Black people sweated more efficiently than whites. Despite lacking any basis in reality, this became prevailing knowledge in Western medical science.

Century after century, their lies were confirmed by peer-review.

In his 1924 lecture at the University of London, Professor Christiaan Eijkman lamented the “white sojourner in the tropics.” After explaining that the “coloured man... is by his pigmentation better protected” against sun and the heat, Eijkman concluded that “the white cannot... keep on doing heavy muscular work in the tropics; he must leave it to the natives.”<sup>11</sup>

Later, M.L. Thomson’s 1954 doctoral research induced sweat in “twenty-one European and twenty-six African male hospital orderlies.” While “no significance can be attached to the difference between grand averages of sweat glands” in Africans and Europeans, he nevertheless argued for a “greater efficiency of the African’s heat-dissipating mechanism.”<sup>12</sup>

Thomson’s research in Nigeria was supported by the Colonial Medical Research Council, a British fund that supported research activities in the colonies. Allocations from the colonial research fund for medical research into “physiology of hot climates” received nearly £200,000, ranking fifth out of twenty funded research areas.<sup>13</sup>

It would seem, through the 20<sup>th</sup> century, that sweat remained important and useful as ever for processes of colonization. A key focus of 1920s and 1930s colonial development was making logistical systems for the extraction of cash crops and minerals. If Black bodies were better suited to sweating than white ones, then the extraction of their labor was not only normalized — it was justified. The physician-colonizer, their task set into motion, wrote the conditions of justification.

## XI. *Meaning as Power, Analytes as Politics.*

The networked sweat sensor, with its growing market capitalization, emerges from this lineage. As I ponder how the health tech market constitutes sweat as both an object of medical inquiry and of capital investment, I am left thinking about how the body isn’t delimited by its skin, subjectivity, or consciousness.

I’m reminded how we are born into ecologies of microflora, microfauna, and microdata, which comprise and exceed us; how the body exceeds itself, and how in that excess we find sweat — literal, bodily, corporeal, which we cannot contain as it spills forth, unwillingly, from the pores.

Sweat remains contextual — its meanings depend upon the bodies that are sweating. Sweat seeps from the pores already gendered, racialized, sexed; seeps not just with meaning, but with power; not just with analytes, but with politics.

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<sup>1</sup> Precedence Research. 2020. “Precision Medicine Market Poised to Grow at 11.5% by 2027.” *GlobeNewswire*.

<sup>2</sup> Grand View Research. 2020. “Biosensors Market Size & Share Industry Report, 2020-2027.” *Grand View Research*.

<sup>3</sup> Absolute Market Insights. 2019. “Global Sweat Sensor Market is Expected to Reach US\$2,591.19 Million by 2027.” *PRNewswire*.

<sup>4</sup> Mattern, S. 2018. “Databodies in Codespace.” *Places Journal*.

<sup>5</sup> Baker, Lindsay B. 2019. “Physiology of Sweat Gland Function: The Roles of Sweating and Sweat Composition in Human Health.” *Temperature* 6 (3): 211–59.

<sup>6</sup> Neff, G. 2019. “The Political Economy of Digital Health.” In *Society and the Internet*, by Gina Neff, 281–92. Oxford University Press.

<sup>7</sup> Renbourn, E.T. 1959. “The History of Sweat and the Sweat Rash From Earliest Times to the End of the 18th Century,” 27.

<sup>8</sup> Tullett, W. 2016. “Grease and Sweat: Race and Smell in Eighteenth-Century English Culture.” *Cultural and Social History* 13 (3): 307–22.

<sup>9</sup> White, C. 1799. “An Account of the Regular Gradation in Man, and in Different Animals and Vegetables...” London: printed for C. Dilly, pp. 58–59. Accessed through University of Glasgow Library at [www.archive.org](http://www.archive.org).

<sup>10</sup> Fanon, F. 2007. *A Dying Colonialism*. Translated by Haakon Chevalier. Nachdr. New York, NY: Grove Press, pp. 123.

<sup>11</sup> Eijkman, C. 1924. “Some Questions Concerning the Influence of Tropical Climate on Man.” *The Lancet* 5253 (203): 887–893.

<sup>12</sup> Thomson, M.L. 1954. “A Comparison Between the Number and Distribution of Functioning Eccrine Sweat Glands in Europeans and Africans.” *Journal of Physiology* (123): 225–233.

<sup>13</sup> Clarke, S. 2013. “The Research Council System and the Politics of Medical and Agricultural Research for the British Colonial Empire, 1940–52.” *Medical History* 57 (3): 338–58.