My Own Private B.O.

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Science

Forensic chemists examined my odorprint. Here's what they smelled.

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This month the Department of Homeland Security announced plans to study the potential of body odor as a means of identifying criminals and figuring out when they're lying. The work will expand on basic research into the chemistry of the so-called human "odorprint," which scientists say is as distinct as DNA. At first whiff, the notion that individual B.O. is as special as a snowflake sounds like a rotten joke. But body odor has proved its value as a biometric for seven centuries, ever since man first started hunting bad guys with the original B.O. detector: the bloodhound.

While dogs certainly deserve a long scratch behind the ears for clueing us in to the odorprint, their days as our elite odor gumshoes may be numbered. (Canines are not as reliable as we once thought: Although the best can match scents with 85 percent accuracy, poorly trained or feeble-nosed dogs may do no better than chance.) Now scientists are figuring out their own, more accurate ways to scrutinize an odorprint. Research on electronic noses may also reveal secrets about how humans recognize each other by B.O. We know, for example, that mothers can pick out their babies by smell, and babies their mothers. Scientists call this the "armpit effect" and suspect that many other animals recognize kin by comparing body odors. This got me wondering: Could the techniques of modern B.O. analysis be used like DNA testing to reconstruct family relationships from drops of sweat? Could this analysis work on my own family? I asked one of the top researchers in the field of criminal odorprinting to help me find out.

Florida International University chemist Kenneth Furton studies the smells that might be of greatest use in a crime investigation. These, he says, are the ones that come from the hands. (Murderers rarely wield weapons in their underarms.) For the last five years, Furton has been cataloging the many chemicals that compose hand scent, including odoriferous acids, alcohols, aldehydes, hydrocarbons, esters, ketones, and nitrogen-containing compounds.

It's a rich brew, but hardly the rankest in the human odor-sphere. Hands don't contain apocrine glands, the funky B.O. factories that reside in the armpit and groin and broadcast sexual status updates. But they do have tons of eccrine sweat glands, used for thermoregulation, and oil-producing sebaceous glands, which generate their own odor signatures. These aromas mix with volatiles from our dead skin cells and exhaled breath before wafting in a plume of body heat.

I challenged Furton to construct my family tree based only on data from our sweaty hands. He had never attempted such an analysis before and made no claim that it would be possible. Yet he agreed to give it a shot. I dragooned my mother, father, Uncle Merritt, and identical-twin first cousins Ricky and Johnny into the experiment.

Odor collection proceeded according to protocol in a pair of secure, television-equipped locations. In Virginia, my mother, father, and I meticulously washed our hands without soap and then waved them around until dry. Next, we rubbed our hands to lather them up with sweat and then clasped them around a piece of gauze. For 10 minutes, we held our hands before us, as if in prayer, while our B.O. impregnated the cloth and we watched *Rachel Maddow*. I am told that during odor collection in California, my uncle and cousins took in a crappy Golden State Warriors game. Three scent samples were obtained from each person and then shipped to Furton's grad student Davia Hudson in Florida, who ran them through a gas chromatograph and mass spectrometer. (Click here for a dendrogram of the data.)

The results were intriguing, though hardly Nobel-worthy. Hudson said our odor profiles were "very similar" but that there was "low reproducibility" among the samples collected from each individual, likely due to contamination. So she discarded one outlier from each subject. Even still, one of the "good" samples collected from my mother came up 94 percent similar to one from her nephew Johnny, which didn't make much sense. The two of them were closer in scent than Johnny and his identical-twin brother Ricky. (Twins should smell alike.)

Still, to my eyes the family odor tree that emerged smelled like home. According to the data, I shared my dad's aroma, with similar ratios of citrus and tallow that surely reflected our shared heritage chomping pork-rib sandwiches. The clones, Ricky and Johnny, were quite alike but for a burnt note that lingered around Ricky, perhaps a side effect of his weakness for Caramel Frappuccinos. In general, the males had similar odor profiles, with the exception of my uncle, who seemed to come from another B.O. planet. He excreted the rudest bouquet—subtly oily, pungent, and sweet—which jibed with behavioral data from the dinner table. The only person who showed a hint of similarity with him—in one sample—was his sister, my mother, who is, after all, more like him than she'd like to admit. (Click here for a chemical breakdown.)

The B.O. Wheel. Click here for details.

They say you are what you eat, and when it comes to B.O., it's true. Body odor can be heavily colored by diet and also by the fragrant beauty products that we use. For this reason, one of the biggest challenges faced by odorprint researchers is to ferret out which chemicals constitute the "primary odor"—the root B.O. bouillon that can't be altered by diet and perfume. When I ran the results of my family experiment past George Preti, a smell researcher whose odorprint work has been funded by the Defense Advanced Research Projects Agency, his main criticism was that several of the odorants used to build my family tree were probably environmental. For example, my cousin Ricky and my uncle both had linalool on their hands, a ubiquitous fragrance compound used in soaps, shampoos, and detergents. But Preti conceded that the notion that I might smell more like my dad than my mom was not outlandish. Unlike genetics, he said, odor inheritance is "not a 50-50 mix."

It may not be surprising to learn that B.O. does indeed vary by gender—a recent study claimed that men smell like cheese while women smell of grapefruit or onions. It also reflects age: Preti's lab has found several odorants that increase with advancing years, such as the aldehyde nonanal. (This is not the molecule others have implicated in "old person smell.") There may even be racial differences in primary odors: Asians, for example, have fewer apocrine sweat glands than blacks or whites. In a new book about scent called *Headspace*, Amber Marks reports that in the 1990s a British electronic-nose company was approached by South African police and asked for the "odor signature" of black people. The company refused, but an employee told Marks that they could have derived such an ethnic odor-type if they'd tried.

If the prospect of a racial B.O. taxonomy gives you the willies, the history of smell discrimination offers no comfort. In the 19th century, Finns, Eskimos, Jews, and others were judged by vigilant European doctors to possess a characteristic unpleasant smell. (Asian docs thought Europeans were the foul ones.) Blacks were thought to be at greater risk of shark attack due to their "ammoniacal" odor. Blondes were said to smell "musky." The old, like "dry leaves." Lunatics, "fetid and penetrating." In 1829, a French scientist proposed a new smell-based forensic identification method but ran into problems discriminating dark-haired women from fair-haired men. Today we know these odor classes are absurd; humans can't even smell the difference between their own B.O. and that of a chimpanzee. But there are some broad patterns to B.O. flavor—for a visual representation, see this chart.

In any event, a new era of odor profiling may soon be upon us. Furton foresees a day when crime scene odor evidence might help cops establish a dossier: fiftysomething Irish-American male, wears Axe body spray, loves garlic. If cops had a suspect, they could trail him and covertly collect an odor sample using a scent capture contraption without touching him or asking permission.

While for centuries our B.O. obsession has focused on preventing its unwelcome trespass, today's worry may be in protecting our right to "odor privacy." For one thing, a body smell may convey private medical information: Both Preti and Furton are seeking the smell

signatures of cancer and diabetes, and Furton is studying the odor differences between depressed and nondepressed individuals. Unlike DNA-rich blood or saliva, scent cannot be withheld from authorities because—alas—there is no "off button" for B.O. And, indeed, scent surveillance is already in use. In 2007, *Der Spiegel* reported that German authorities had collected scent samples from activists in advance of the G8 summit.

Privacy hurdles aside, the odor chemists' greatest challenge may be in overcoming our mistrust of smell. Odors can linger, sometimes for days, and they are invisible, so it can be hard to pin down their origins. An old grade-school maxim—"he who smelt it dealt it"—illustrates the risks in making accusations based on olfactory evidence. At this point, it's not clear that odor science has the tools to move past this folk wisdom.
