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# Knowledge, Norms, and Noses Across the Olfactory Threshold <sup>1</sup>

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William Tullett

## Abstract:

*Drawing on historical medical, scientific, and psychological publications, this article offers a brief history of the idea of the »threshold«, insofar as it has been applied to smells and smelling. It follows two genealogies of smell-related thresholds, firstly backwards from 1980s cultural history, via 1930s sociology and psychoanalysis, to 1840s psychophysics, and then forwards from psychophysics, via fin-de-siècle experimental psychology, to 1980s environmental governance. Responding to concerns about the epistemological utility of smelling in the eighteenth century, the nineteenth century witnessed attempts to render olfaction amenable to measurement, quantification, and visualization. Experimental psychologists aimed to construct pure noses and pure smells through experimental assemblages that used physical thresholds to give validity to the idea of olfactory thresholds. Since the 1950s these assemblages have been leveraged in regulating odor pollution. However, as in the case of environmental governance, the laboratory-origins of olfactory thresholds should give pause to smell studies scholars who seek to deploy the concept as an analytical tool or form of narrative emplotment.*

**Keywords:** *Biopower, Environment, Psychology, Smell, Threshold*

According to Alain Corbin, in his landmark 1982 work *The Foul and the Fragrant*, nothing less than an olfactory revolution occurred in the decades after 1750. A vast deodorization project emerged that would come to define modernity's relationship with scent. According to Corbin, this was provoked by a change in sensibility that combined an increased sensitivity to odours and inclination to react to them with disgust:

»From about the middle of the eighteenth century, odors simply began to be more keenly smelled. It was as if thresholds of tolerance had been abruptly lowered, and that happened well before industrial pollution accumulated in urban space [...] scientific theory played a crucial role in this lowering of thresholds.«<sup>2</sup>

The idea of »thresholds of tolerance« was central to Corbin's narrative. Other sensory scholars have followed suit. Hans Rindisbacher traces »an ongoing shift in thresh-

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1 The research for this article has been supported by the European Union's Horizon 2020 program project Odeuropa under grant agreement number 101004469.

2 Alain Corbin, *The Foul and the Fragrant*, Cambridge, MA 1986, p. 56.

old levels of perception« in nineteenth-century Europe that reflected »an increasing awareness of smells, above all unpleasant ones«. <sup>3</sup> For historians of the relationship between smell and disease, urban sanitation, colonial regimes of sensing, and bodily cleanliness, the idea of shifting thresholds has offered a useful form of narrative emplotment. <sup>4</sup> Whilst Corbin emphasized a shift in sensitivity that led to changes in the smellscape, others have reversed the relationship between the perceptual chicken and the environmental egg by suggesting that the nineteenth-century deodorization of the environment created an expectation for less odorous spaces. <sup>5</sup>

Sound studies scholars have given sustained attention to the conceptual histories of the field's founding terms. <sup>6</sup> In the case of smell, work has tended to focus on critiquing narratives of progress and modernization, unpicking the history of the term »deodorization«, or questioning the idea that nineteenth-century modernity saw the birth of a new odorophobic sensibility by arguing that the early modern and medieval periods were home to similar fears. <sup>7</sup> A further critique has pointed out that by tracing a history of deodorization that ends in a supposedly less odorous present, historians that invoke an ever-lowering threshold of olfactory disgust re-impose and re-assert the normative nature of odourless bodies and spaces in the present. <sup>8</sup> This only adds to the stigmatization suffered by those judged odorous or in need of deodorizing by western-European norms. <sup>9</sup>

It is often noted that the concept of »soundscape«, which was initially a tool for identifying and protecting the earth's acoustic ecology, was inspired by the 1960s and 1970s environmentalist movements. <sup>10</sup> What is less often recognized is that Corbin's discussion of deodorization and olfactory thresholds emerged at precisely the same time

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3 Hans Rindisbacher, *The Smell of Books. A Cultural-Historical Study of Olfactory Perception in Literature*, Ann Arbor, MI 1992, p. 21.

4 Alicia Simmonds, *Sex Smells. Olfaction, Modernity and the Regulation of Women's Bodies 1880-1940*, in: *Australian Feminist Studies* 34 (2019), pp. 232-247; David S. Barnes, *Scents and Sensibilities. Disgust and the Meanings of Odors in Late Nineteenth-Century Paris*, in: *Historical Reflections/Reflexions Historiques* 28 (2002), pp. 21-49; Andrea Montanari, *The Stinky King. Western Attitudes toward the Durian in Colonial Southeast Asia*, in: *Food, Culture, and Society* 20 (2017), pp. 395-414; Virginia Smith, *Clean. A History of Personal Hygiene and Purity*, Oxford 2007, pp. 15f.

5 Chris Otter, *Making Liberalism Durable. Vision and Civility in the Late Victorian City*, in: *Social History* 27 (2002), pp. 7f.

6 Jonathan Sterne, *Soundscape, Landscape, Escape*, in: Karin Bjisterveld (ed.), *Soundscape of the Urban Past*, Bielefeld 2013, pp. 181-194; Ari Y. Kelman, *Rethinking the Soundscape. A Critical Genealogy of a Key Term in Sound Studies*, in: *The Senses and Society* 5 (2010), pp. 212-234.

7 Mark Jenner, *Civilization and Deodorization? Smell in Early Modern English Culture*, in: Peter Burke et al. (eds.), *Civil Histories*, Oxford 2000, pp. 127-144; William Tullett, *Re-odorization, Disease, and Emotion in Mid-Nineteenth-Century England*, in: *The Historical Journal* 62 (2019), pp. 765-788; Dolly Jørgensen, *The Medieval Sense of Smell, Stench, and Sanitation*, in: Ulrike Krampfl et al. (eds.), *Les cinq sens de la ville du Moyen Âge à nos jours*, Tours 2013, pp. 301-313.

8 Nat Lazakis, *Body Odor and Biopolitics. Characterizing Smell in Neoliberal America*, Jefferson, MO 2021, pp. 37-62.

9 Benjamin Aldes Wurgaft, *Incensed. Food Smells and Ethnic Tension*, in: *Gastronomica* 6 (2006), pp. 57-60; Michelle Ferranti, *An Odor of Racism. Vaginal Deodorants in African-American Beauty Culture and Advertising*, in: *Advertising & Society Review* 11 (2011), doi:10.1353/asr.2011.0003.

10 Kelman, *Rethinking the Soundscape*, p. 244.

that odour regulation was becoming a field for policy intervention across Western Europe and the U.S.<sup>11</sup> Prompted by environmentalist concerns about air quality, the clash of new housing developments with intensive livestock farming, and the migration of city-dwellers to the countryside, the 1980s witnessed the development of new national standards for odour pollution. New odour-regulation policies depended on identifying the thresholds at which odours became an annoyance and then using laboratory techniques to assess whether odours at particular locations exceeded the threshold or not. Corbin's history depended on charting the lowering of the threshold at which odours were detectable and subject to reactions of disgust. The threshold was therefore at the centre of both Corbin's history and the emerging field of odour-regulation.

To more critically understand the terms that scholars of the olfactory past deploy, this article begins to sketch a history of the »threshold« as an important concept that has linked smell with histories of science, classification, and emotions. In exploring the history of this term in Europe and the United States, we cross between multiple fields of knowledge. The article begins by briefly tracing the most commonly invoked genealogy for ideas about thresholds of olfactory tolerance back to Freudian psychoanalysis. In pursuing this course, we can also move back further into the psychophysics of the 1840s. Having reached the 1840s we can find, in psychophysical work, the first attempts to accurately develop odour thresholds in experimental settings. The article then begins to move forwards in time again, tracking the evolution of ideas about odour thresholds and their detection.

In offering an initial interpretation of this history, this paper contributes to a broader scholarship on »thresholds« and contemporary sensory politics. The threshold is now central to the regulation of water quality and air pollution. However, the regimes of perception that underwrite these thresholds involve the purification of sensory experience: through a process of abstraction that locates acceptable knowledge in the laboratory, far from the bodies and environments in which environmental incidents occur, these regimes create quantitative sensory data that is often at odds with the experience of citizens on the ground.<sup>12</sup> This article is a contribution to charting this process – the construction of pure smells and pure noses abstracted from their wider contexts.

## 1982-1840: From Corbin to Psychophysics via Freud

One route by which we can trace the historical application of thresholds for smell stretches back into early twentieth-century sociology and late nineteenth century psychoanalysis. We could start with the work of Dominique Laporte, which is cited in the introduction to Corbin's *The Foul and the Fragrant*. Laporte's 1976 *History of Shit* traced the link between the development of sanitation, the repression of the faecal, and modern ideas of the self. Having discussed the expulsion of city smells through six-

11 A.P. (Ton) van Harreveld et al., A Review of 20 Years of Standardization of Odor Concentration Measurement by Dynamic Olfactometry in Europe, in: *Journal of the Air & Waste Management Association* 49 (1999), pp. 705-715.

12 Christy Spackman, In Smell's Shadow. Material Politics at the Edge of Perception, in: *Social Studies of Science* 50 (2020), pp. 418-439; Nerea Calvillo, Political Airs. From Monitoring to Attuned Sensing Air Pollution, in: *Social Studies of Science* 48 (2018), pp. 372-388.



teenth-century sanitation Laporte noted that »the passage from promiscuity to modesty cannot occur without a refinement of the sense of smell that entails a lowering of the threshold of tolerance for certain odors«. <sup>13</sup> Here the footnote takes us not to a study of street-cleaning but to the work of French historian Jean-Louis Flandrin and his 1972 work *Families in Former Times*. In a brief aside Flandrin had contrasted the »neurotic individualism« of modern bourgeois relations, born of a refinement of olfactory sensibilities, with the communal sleeping that characterized earlier peasant life. <sup>14</sup> From Corbin to Flandrin via Laporte, we have already moved from the concern with science and sanitation into the home and the themes of familial and bodily intimacy.

Moving from the street to the body and further back in time we find the work of the sociologist Norbert Elias. In Corbin's history of smell Elias only gets a brief aside in a footnote and none of his works are cited. However, Corbin's narrative and his ideas about »thresholds of tolerance« are strongly reminiscent of Elias' work, which traced a history of European modernity in which social structure developed in tandem with the »advance of shame and repugnance thresholds«. <sup>15</sup> This was a change in sensibility, as a greater disgust arose around odours. However, it was also a change in *sensitivity* by which Europeans became less sensitive to the smells of nature and more sensitive to body odours. <sup>16</sup>

In thinking about smell and the boundaries of the body Elias was invoking a longer tradition in European thought that understood smell as a sensory »gateway« at the »threshold of the body« that rejected noxious atmospheric or alimentary substances. <sup>17</sup> The idea of the body as a castle or house protected by the senses could be found in early modern, medieval, and ancient writings across literature, theatre, philosophy, and medicine. <sup>18</sup> In these examples thresholds of affect were linked to thresholds between self and other, private and public, or body and environment.

However, Elias was also harking back to Sigmund Freud's *Civilization and its Discontents*, in which several scholars have located the roots of the link between narratives of modernization and deodorization. <sup>19</sup> Freud explicitly alluded to the progressive historical lowering of thresholds of tolerance by reference to a selection of examples:

»We do not think highly of the cultural level of an English county town in Shakespeare's time when we read that there was a big dung-heap in front of his father's house in Stratford [...]. We are astonished to learn of the objectionable smell which emanated from the *Roi Soleil* [Louis XIV].« <sup>20</sup>

13 Dominique Laporte, *History of Shit*, Cambridge, MA 2002, p. 38.

14 Jean-Louis Flandrin, *Families in Former Times. Kinship, Household and Sexuality*, Cambridge 1976, p. 101.

15 Corbin, *The Foul and the Fragrant*, p. 234, fn6; Stephen Mennell, Review: *The Foul and the Fragrant*, in: *American Journal of Sociology* 93 (1987), p. 729; Norbert Elias, *The Civilizing Process*, London 1994, p. 493.

16 Norbert Elias, *The Civilizing Process. Vol II: Power and Civility*, Oxford 1982, p. 298.

17 Edmund Roughton, *The Importance of Nasal Obstruction*, in: *The Practitioner. A Journal of Therapeutics and Public Health* 42 (1889), p. 188; John Campbell, *On Vision*, in: *Annals of Philosophy* 10 (1817), p. 18.

18 Louis Vinge, *The Five Senses. Studies in a Literary Tradition*, Lund 1975.

19 David Howes, *Sensual Relations. Engaging the Senses in Culture and Theory*, Ann Arbor, MI 2003, pp. xiv–xv.

20 Sigmund Freud, *The Future of an Illusion, Civilization and Its Discontents, and Other Works*, London 1981, p. 93.

Elsewhere, Freud argued that the process of development from childhood to adulthood involved a gradual increase in repulsion to excrements, which were »doomed by their strong smells to share the fate which overtook olfactory stimuli after man adopted the erect posture«. <sup>21</sup> It was the adoption of this erect posture and the »devaluation of olfactory stimuli« that led to the beginnings of the family unit and the »threshold of civilization«. <sup>22</sup>

Freud's understanding of smell had roots in earlier nineteenth-century work in the realm of psychophysics. Principle among the psychophysical writers that influenced Freud was Gustav Fechner, whose work began in the 1840s and might be said to culminate in his 1860 book *Elemente der Psychophysik*. <sup>23</sup> Fechner developed the idea of the threshold in ways that continue to be influential today. The »basic psychophysical law« that became known as »Fechner's law« introduced a series of thresholds for understanding sensation. At one end there was the »threshold« of sensation, below which nothing could be sensed, and at the other end was the »summit« of sensation beyond which an increase in intensity of sensation would be impossible. Between these two there existed a »threshold of distinction« when a sensation became describable. Between the threshold and the summit, the intensity of sensation increased as the intensity of the stimulus increased along a »psychophysical curve«. <sup>24</sup> In his observations on the devaluation and repression of olfactory stimuli Freud might be said to have historicised the shifting of Fechner's thresholds. In doing so Freud combined the affective, aversive, and defensive connotations of threshold that had such a long historical tradition with the sensitivity to sensation described by Fechner.

As it worked its way from Fechner and Freud to Elias, Larpote, and Corbin, the notion of threshold entwined sensitivity to smell with affect in the form of disgust and shame. However, if we start from nineteenth-century psychophysics we can also follow the threshold along a different journey.

## Emotion, Smell and Psychology c.1840

Before we start this journey forward in time, it is useful to sketch a brief summary of the shifting study of smell before the emergence of psychophysics in the mid-nineteenth-century. The cumulative impact of a succession of changes had been to encourage profound scepticism about the ability to categorise odours in ways that went beyond the emotive binary of pleasant and disgusting. In the early modern period medicine, natural history, chemistry, and botany had been the chief arenas in which smell was epistemologically valued and in which attempts to categorise odours and

21 Freud, *The Future of an Illusion*, p. 100, fn1.

22 *Ibid.*, pp. 99f., fn1.

23 For an introduction to the wider influence of psychophysics on the cultural history of the senses, see Erica Fretwell, *Sensory Experiments. Psychophysics, Race, and the Aesthetics of Feeling*, Durham, NC 2020; Lawrence E. Marks, *Freud and Fechner, Desire and Energy, Hermeneutics and Psychophysics*, in: Hans-Georg Geissler et al. (eds.), *Cognition, Information Processing, and Psychophysics. Basic Issues*, London 1992, pp. 23-42.

24 Henri F. Ellenberger, *Fechner and Freud [1956]*, in Mark S. Micale (ed.), *Beyond the Unconscious*, Princeton 1993, pp. 89-103.

understand smelling could be found. Seventeenth- and early-eighteenth-century medicine deployed a humoral understanding of smell in which nasal preferences, sensitivities, and the powers of smells themselves could be understood through a mix of cold, hot, dry, and moist that determined bodily temperaments, affective dispositions, and the powers of medicines. Many categorizations of smell in medicine and natural history followed this model in uniting agreeableness or offensiveness with the medical effects and material qualities of odours.<sup>25</sup>

However, the scepticism about smell's ability to connote medical virtue grew slowly from the 1770s onwards. During the first half of the nineteenth century medical writers taught their readers that classifications based on smell – or any sensible property – were limited both by the inability to adequately define sensations and the fact that medicinal powers and sensory properties had no fixed relationship.<sup>26</sup> By the 1870s and 1880s authors berated John Floyer's 1687 work for ignoring subjective variations in taste, and writers described Linnaeus' 1750s work as »more curious than useful«. <sup>27</sup> Medical lecturers in the U.S. and physicians in Britain described the use of smell in classification as characteristic of the »earliest« attempts to understand medicines in »former times« that could be consigned to history with the older »doctrines of signatures«. In the 1880s »no intelligent physician administers drugs on such a basis« and instead medicines should be classified »according to their physiological and therapeutic actions on the human system«. <sup>28</sup>

According to writers in psychology, medicine, and natural history this was because of the ostensibly subjective and emotive nature of smelling. The English surgeon and physician William Spencer Watson, author of the standard work on diseases of the nose in the final quarter of the nineteenth century, held hope that chemical classifications of odours might overcome the problem of individual idiosyncrasy in more »metaphysical classifications«. However, he noted that a repulsive association was just as likely to make a perfume disgusting as the scent itself. <sup>29</sup> In sum, nineteenth-century medicine came to argue that the social and affective context in which smells were assessed, coupled with the indeterminacy of the relationship between sensory properties and medical efficacy, meant that physiological experience and response was a surer guide to the classification of medicines than smell.

However, some early psychologists took up the idea of categorizing smell by its effects – affective and physiological – on human bodies. In 1855 the Scottish polymath Alexander Bain attempted to marry the social and sensational in his classification of smells. Bain suggested a series of binaries that were linked to different organs: fresh or close odours that simulated or dampened respiration; appetitive and nauseous odours that increased or decreased hunger; and sweet and stinking scents that were pleasant

25 Tullett, *Smell in Eighteenth-Century England*, pp. 92-99.

26 Jonathan Pereira, *The Elements of Materia Medica and Therapeutics*, London 1842, p. 159.

27 Edward John Waring, *Bibliotheca Therapeutica*, London 1878, pp. 72f., 75; Charles J. Hempel, *Materia Medica and Therapeutics*, Chicago 1880, p. 23.

28 John Brodhead Beck, *Lectures on Materia Medica and Therapeutics*, New York 1861, p. 29; Robert Edmund Jackson, *Note-book of Materia Medica. Pharmacology and Therapeutics*, Edinburgh 1871, pp. 76, 80; L. F. Maire, *The Physiological Action of a Drug Its Therapeutical Guide*, in: *The Medical Age* 3 (1885) p. 54.

29 William Spencer Watson, *Diseases of the Nose and its Accessory Cavities*, London 1875, pp. 15f.

or painful. These three binaries were joined by the categories of pungent (the sensations of the trigeminal nerve) and the ethereal (ethers and anaesthetics).<sup>30</sup> By emphasizing the categorization of odours according to the »sympathies of the organs« of the body Bain was evoking the early-nineteenth-century Parisian clinical school of medicine with its emphasis on observable changes within organs as the guide to disease.

Bain's emphasis on physiological experience in classifying odours – and his attempt to include emotional and associative context – was to have an influence on later work including Carl Max Giessler's 1894 monograph on smell. This also drew on the work of Gustav Jäger, who had argued in the 1880s that the smell of a living being constituted its soul and who had measured emotional responses to smells using a hipp chronoscope (which measured reaction times).<sup>31</sup>

Giessler's work took this in a new direction by observing the power of association in transforming or overcoming reactions of olfactory disgust. Whilst other writers had tried to arrange and categorise odours based on universal affective, medical, or botanical classes, Geissler envisaged a whole series of levels for categorizing odours: various »scales« of odours might apply to all animal creation, only to humans, only to the educated, only to women, or even only to specific individuals with particular occupational or intellectual interests. Geissler offered the example of a tradesman who valued the odours of his materials or a delight in the odours of manure that came from knowing the substance's economic value. Both examples demonstrated how affective responses to smell drew »from the associative structures which are gradually added to the olfactory sensation«.<sup>32</sup>

Whilst Bain and Giessler's work represented one approach to olfaction within psychology, another drew on psychophysical experimentation in a laboratory setting. In the second half of the nineteenth century researchers attempted to render smell amenable to quantification, normalization, and visualization. These new attempts to categorise both odours and olfactory sensitivities attempted to get beyond the hedonic impasse in which it was held that smells could only ever be classified as pleasing or offensive. What occurs in the late nineteenth and early twentieth centuries is nothing less than an attempt to construct the normative nose and smells as a purified, measurable object for scientific quantification.

## 1840-1982: From Psychophysics to Corbin via Zwaardemaker

In the same period in which Fechner began his psychophysical work we also see the first attempts to measure the intensity of odours experimentally. In the 1840s Gabriel Gustav Valentin performed experiments that attempted to understand the relative power of different scents. This involved the gradual dilution of the scent – including musk, bromine, and garlic – by mixing the odorous gas with gradually larger volumes of air or by vaporizing smaller and smaller concentrations of the odorous gas in a

30 Alexander Bain, *The Senses and the Intellect*, London 1855, pp. 164-170.

31 Gustav Jäger, *Die Entdeckung der Seele*, Leipzig 1880, pp. 205-209; idem, *Dr Jaeger's Essays on Health-Culture*, London 1887, pp. 208f.

32 Carl Max Giessler, *Wegweiser zu einer Psychologie des Geruches*, Leipzig 1894, pp. 65-68.

known amount of air.<sup>33</sup> A similar approach was taken by E. Fischer and F. Penzoldt in 1887, when they spritzed a gradually larger and larger amount of mercaptan dissolved in alcohol into a room, which was then mixed by a fan. The test subject then had to enter the room – that is, to cross the threshold – to sniff and establish at what volume the substance could be perceived.<sup>34</sup> Jacques Passy undertook similar experiments in the 1890s.<sup>35</sup>

In 1887 a new tool emerged for determining the sensitivity of noses and the intensity of odours: the olfactometer. Devised by the Dutch psychologist Hendrik Zwaardemaker, this was composed of two tubes fitted each other. The outer tube was made from a scented material (or a material that could be imbued with scent) whilst the inner one was made of glass and had a centimetre scale on the side. The inner tube was fitted to a board with a handle and was bent upwards on one side of the board to meet the nostril of the subject. By pushing the out tube away more of its surface was uncovered and so more of the odour travelled down the inner tube to the nose when the subject inhaled. The distance at which a distinct smell could be observed – measured in centimetres – was an »olfactie« and sensitivities could be expressed in multiples of an »olfactie«. In the ensuing years a range of different olfactometers were introduced that built on Zwaardemaker's instrument.<sup>36</sup>

In the 1950s and 1960s field olfactometers were developed – principally in the United States – that also aimed to assist in the interpretation of olfactory nuisances and pollution incidents.<sup>37</sup> Olfactometry – in both the laboratory and in the field – is still a widely practised technique for assessing sensitivity to smells and the strength of odours. This ensures the continued importance of »thresholds« in the study of olfaction. However, a series of assumptions and practices were (and still are) built into olfactometry. The end result of these assumptions was to abstract, disembodify, and dismember the sense of smell into a series of component parts that were divorced from everyday sensory and affective atmospheres.

One quest to which the olfactometer and the idea of olfactory »thresholds« was closely linked was the attempt to plot a normative or normal nose. This was one example of a broader nineteenth-century »biopolitics of sensation« that aimed to measure and compute sensorial norms for entire populations.<sup>38</sup> The ability to measure olfactory sensitivity in terms of »olfacties«, the dilution to threshold test, or the ability of

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33 Gabriel Gustav Valentin, *Lehrbuch der Physiologie des Menschen*, Braunschweig 1848, pp. 280-283.

34 »Notes«, in: *The American Journal of Psychology* 1 (1888), pp. 357f.

35 Jacques Passy, Note sur les minimums perceptibles de quelques odeurs (30 janvier), in: *Comptes rendus hebdomadaires des séances et mémoires de la Société de biologie* 44 (1892), pp. 84-88.

36 Serge Nicholas/Moustafa Bensafi, A Historical Review of Olfactometry. The Invention of the Olfactometer by Hendrik Zwaardemaker in 1888 and Pioneering Work in Olfactometry at the Turn of the 20th Century, in: *Topics in Cognitive Psychology* 121 (2021), pp. 311-351; Bernice M. Wenzel, Techniques in Olfactometry. A Critical Review of the Last One Hundred Years, in: *Psychological Bulletin* 45 (1948), pp. 231-247; J. F. Mateson, Olfactometry. Its Techniques and Apparatus, in: *Journal of the Air Pollution Control Association* 5 (1955), pp. 167-170.

37 Norman A. Huey et al., Objective Odor Pollution Control Investigations, in: *Journal of the Air Pollution Control Association* 10 (1960), pp. 441-446.

38 Mark Paterson, The Biopolitics of Sensation, Techniques of Quantification, and the Production of a »New« Sensorium, in: *Resilience* 5 (2018), pp. 67-95.

subjects to arrange solutions in order of strength, meant that smell could be rendered amenable to quantification. One of the original uses that Zwaardemaker suggested for the olfactometer was assessing anosmia in which the sense of smell was lost or degrees of hyposmia in which the sense of smell was damaged. In this case it was necessary for a »normal sense of smell [...] to gauge the new olfactometer«. <sup>39</sup> It is no accident that some of the earliest experiments with the olfactometer, from which Zwaardemaker's initial figures for the norm of olfactory acuity derived, occurred at a military hospital. <sup>40</sup> An institution commonly associated with curation of biopower played host to initial experiments that aimed at establishing the olfactory norms of human populations.

The olfactometer quickly became implicated in the broader biopolitics of smell. In the later nineteenth century psychologists using olfactometers and »osmometers« (simply a selection of diluted solutions of an odorant) explored how women, criminals, and non-Europeans varied against a white, male, middle-class, nasal norm. In Edward L. Nichols' and E. H. S. Bailey's experiments these tests revealed that »the sense of smell is in general much more delicate in the case of male than female observers«. <sup>41</sup> Writing to the British sexologist Havelock Ellis, Nichols admitted that these results were »the opposite of our preconceived notions concerning such differences«. <sup>42</sup> These findings went against a long historical tradition of associating greater olfactory sensitivity with femininity. <sup>43</sup> The same tone of surprise characterized the criminologist Cesare Lombroso's investigation into the olfactory capabilities of sexual criminals. In an 1891 study Lombroso compared »normals« with prostitutes using Nichols' and Bailey's method and found – in contradistinction to previous qualitative work on the topic – that criminals were far less sensitive to odours than »normal« individuals. <sup>44</sup>

Lombroso also made comparisons between European and non-European noses. A study of the Dinka people in Sudan suggested that »contrary to what is believed to hold among savages, their smell was obtuse«. <sup>45</sup> This also went against a long-running stereotype of the non-European whose nose was closer to that of an animal in its acute sensitivity. <sup>46</sup> Lombroso was not the only one to pursue this type of investigation. An English study of the Todas people in India, published in 1905, used solutions of camphor to compare English and Toda subjects and concluded that their experiments leant »no support whatever to the idea that the acuity of smell is greater in savage than in

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39 H. Zwaardemaker, On Measurements of the Sense of Smell in Clinical Examination, in: *The Lancet*, June 29<sup>th</sup> (1889), pp. 1300f.

40 Nicholas/Bensafi, *A Historical Review*, pp. 324f.

41 Edward L. Nichols/E. H. S. Bailey, *The Sense of Smell*, in: *Nature* 35 (1886), pp. 74f.

42 Havelock Ellis, *Man and Woman*, London 1894, p. 126.

43 Constance Classen, *The Witch's Senses. Sensory Ideologies and Transgressive Femininities from the Renaissance to Modernity*, in: David Howes (ed.), *Empire of the Senses*, Oxford 2005, pp. 85-105; Cheryl Krueger, *Decadent Perfume. Under the Skin and Through the Page*, in: *Modern Languages Open* 1 (2014), <http://doi.org/10.3828/mlo.voi1.36> [accessed 1.8.2022].

44 Cesare Lombroso/Salvatore Ottolenghi, *Die Sinne der Verbrecher*, in: *Zeitschrift für Physiologie* 2 (1881), pp. 337-344.

45 Cesare Lombroso/Mario Carrara, *Contributo all'antropologia dei Dinka*, in: *Atti della Società romana di antropologia* 4 (1896/7), p. 103.

46 William Tullett, *Grease and Sweat. Race and Smell in Eighteenth-Century English Culture*, in: *Cultural and Social History* 13 (2016), pp. 307-322.

civilized races«.47 Whilst the results – that criminals, women, and non-Europeans might actually be less sensitive to smells than white, male Europeans – were sometimes surprising to a nineteenth-century mind, it is clear that one of the chief goals of olfactometric research in the late-nineteenth and early-twentieth-centuries psychology was to gauge the olfactory norms of populations.

The quest to understand »normal« olfactory thresholds also led to a second key project: the attempt to generate an understanding of »pure« smells that would help account for their unique psychological or sensory properties. It has been suggested that the nineteenth century, which saw the development of laws of »specific sensory energies«, led to the separation and specialization of the senses.48 Technologies such as the kaleidoscope and the stethoscope contributed to the isolation and separation of distinct modes of sensory perception.49 The olfactometer and experiments with olfactory thresholds and classification were part of the same process of abstraction and isolation.

Take, for example, the attempt of Hans Henning to develop a new »prism« categorization of smells. In his work during the late 1910s Henning sought to distinguish between the »true odour« and the »object-smell« that was »distorted by associative supplementing« by having the participants in his experiments close their eyes when sniffing.50 Similar desires to examine »pure« smell also led to studies that tried to separate the tingling of the trigeminal nerve from smell.51 The work of anatomists such as Gabriel Valentin, Moritz Schiff, and Zwaardemaker, which involve cutting the olfactory nerves of puppies or trying out ammonia and snuff on known anosmics, revealed that the pungent effects of these stimuli were separate from pure smell.52

The end goal seems clear from diagrammatic representations of olfactometry. Both Zwaardemaker's illustrations and examples from late nineteenth-century textbooks depict a floating head or simply a ghostly nose floating in space at the end of the olfactometer's tube.53 In a description of her work on olfactory thresholds published in 1898 the psychologist Eleanor Gamble records several attempts to control and isolate the odours being used and this extended to covering the walls and floor of the room in which experiments were carried out with oiled paper or oil-cloth.54 Another solution was to physically isolate the head from the rest of the body, which was achieved in the 1920s using a »camera inodorata«. This was a box with glass and aluminium walls with a bottom cover that fitted over the neck, effectively isolating the head alone in a makeshift »room«. Mercury vapour and ultraviolet radiation were used to get rid of any odours to obtain an »olfactory vacuum«. Under these conditions odours were more easily detectable and, of course, could be analysed in almost complete separation

47 W. H. R. Rivers, *Observations on the Senses of the Todas*, in: *Journal of Psychology* 1 (1905), p. 388.

48 Robert Jütte, *A History of the Senses from Antiquity to Cyberspace*, London 2005, pp. 219f.

49 Jonathan Crary, *Techniques of the Observer*, Cambridge 1992, p. 136; Jonathan Sterne, *The Audible Past*, Durham, NC 2004.

50 Ann-Sophie Barwich, *Smellosophy. What the Nose Tells the Mind*, Cambridge, MA 2020, p. 96.

51 George Trumbull Ladd, *Outlines of Physiological Psychology*, New York 1891, p. 232.

52 Stanley Finger, *Origins of Neuroscience*, Oxford 2001, p. 182.

53 Henrik Zwaardemaker, *Die Physiologie des Geruchs*, Leipzig 1895, p. 198; Edward Wheeler Scripture, *Thinking, Feeling, Doing*, Meadville, PA 1895, p. 127, fig. 71.

54 Eleanor Acheson McCulloch Gamble, *The Applicability of Weber's Law to Smell*, in: *The American Journal of Psychology* 10 (1898), p. 117.

from other intervening scents or sensory stimuli.<sup>55</sup> Finally, this tendency developed in ever-more-exaggerated ways in the mid-twentieth century. In 1950 psychologists at Cornell University developed an »olfactorium«, a whole room rendered »odour-proof« via an assemblage of architectural and hygienic technologies. The camera inodora and the later olfactorium deployed a whole range of deodorizing technologies that included hair-cutting, washing with odourless soap, covering the body with Vaseline, clothing made from odourless-plastic, ventilation, and airlocks.<sup>56</sup>

To measure olfactory thresholds late-nineteenth and early-twentieth-centuries experimenters constructed a spatial threshold between the individual and the environment. The ability to construct knowledge of olfactory thresholds was bound up with rules about what could not cross the threshold of the laboratory and its spaces. In these experiments smell was disassociated from the common multi-sensory experiences of daily life. This separation of the odorant and the olfactory object was, no doubt, further encouraged by the use of synthetic scents, essential oils, and odorous molecules in glass containers or infused in olfactometric tubes. The ability to compute olfactory thresholds for different smells involved the complete separation of individual odours, that would be sensed against a deodorized, cleansed, and blank olfactory canvas.

Whilst experimental psychologists were happily isolating smell from its environmental contexts, medical practitioners, sanitarians, and public health officials were sceptical about the utility of the results thus produced. In 1923 the U.S. sanitarian J. Rosslyn Earp noted that the ability to categorise odours was highly desirable for sanitary science. However:

»[...] though a defensible classification on the basis of the relation of odors to the chemical constitution of the specific odorous substance has been envisaged by Henning it is difficult to see how such a classification could be useful in evaluating the extent of a nuisance. The magistrate will simply have to ask this question: Is the smell disagreeable to the majority of human beings or is it not?«<sup>57</sup>

There was clearly a tension between classifications developed in the laboratory and those that might be useful on the street. In 1909 a British chemist Morris J. Williams wrote to the *Lancet* to lament the lack of a vocabulary for smell – particularly when teaching the material properties of different medicines to students. For this purpose, the author desired a series of »pure definite chemical bodies to avoid mixed smell« and that these »primary« smells could be used in school teaching as primary colours were.<sup>58</sup> Respondents were sceptical. The writers for *The Medical Brief*, a U.S journal, noted that they seriously doubt the working of his classification scheme in crowded districts and tenements, where it is by no means always possible to »choose pure definite bodies«. <sup>59</sup>

55 Dean Foster et al., An Olfactorium, in: *The American Journal of Psychology* 10 (1950), pp. 431f.; Bernice M. Wenzel, Olfactometric Method Utilizing Natural Breathing in an Odor-Free »Environment«, in: *Science* 121 (1955), pp. 802f.

56 Foster et al., An Olfactorium, pp. 431-440; Morana Alac, Beyond Intersubjectivity in Olfactory Psychophysics II. Troubles with the Object, in: *Social Studies of Science* 50 (2020), pp. 474-502.

57 J. Rosslyn Earp, Odors. Their Sanitary Significance and Their Elimination, in: *American Journal of Public Health* 13 (1923), pp. 284f., 287.

58 Morris J. Williams, Smells and their Classification, in: *The Lancet* (1909), pp. 1795f.

59 *The Medical Brief*, 38 (1910), p. 222.



The problem with applying olfactometric techniques to matters of pollution and public health became clear in the 1950s and 1960s when measuring instruments were developed in the U.S. The first of these devices, the »scentometer«, was a rectangular box in which samples of the ambient air could be mixed with odour-free air at various levels of dilution. This would allow the smell-witness to measure the degree of dilution required so that the smell was no longer detectable. However, the conditions of deodorization and isolation achievable in the laboratory could seldom be achieved in the field where the observer was surrounded by odours.<sup>60</sup> Importantly, olfactometric measurement of thresholds could not deal with emotional judgements of pleasure or disgust: only the intensity of an odour could be measured. In the 1970s and 1980s odour regulation developed across Europe and North America, initially focusing on the odours emitted by the livestock industry. These regulations were often backed by laboratory-based olfactometry in which panels assessed samples in modern olfactometers. However, the regulations often focused on intensity rather than offensiveness and the variability of olfactory sensitivity made representative panels difficult to put together.<sup>61</sup> The normal nose and deodorized atmospheres on which experimental psychology had relied proved difficult to replicate when it came to public health.

## Conclusion

Having taken a brief tour through the history of olfactometry we have now ended up back in the 1980s when Corbin advocated for a history of olfactory thresholds. Historians have borrowed the notion of the threshold from the psychological and environmental sciences. But they have done so without critically engaging with the historical development and deployment of the concept. The effects of this borrowing can still be seen in contemporary olfactory history. As Mark Jenner has pointed out, scholars have offered two – arguably mutually contradictory – narratives. On the one hand from the eighteenth century onwards Europeans ostensibly were *desensitized* to odours by an ocularcentric modernity that required them to look rather than smell. However, at the same time, they also became *sniffier* as their intolerance of odours led to attempts to deodorize bodies and spaces.<sup>62</sup> Two types of thresholds – sensitive and hedonic – have been curiously blended. The doubled meaning of threshold – as detection and as disgust – is in line with the history of its deployment in psychology and odour regulation.

This history also demonstrates that, in order to function in an experimental or sanitary context, different types of physical and physiological thresholds have often been nested and layered. One of the hallmarks of psychophysical experiments with odour was that the determination of olfactory thresholds required the manipulation and crossing of spatial thresholds: whether miniaturized in the mobile scentometer or in inodorous laboratory spaces. The various solutions used by experimental psychologists to create an odourless backdrop parcelled up the atmosphere into discontinuous

60 Noga Morag-Levine, *Chasing the Wind*, Princeton, NJ 2003, pp. 132f.

61 Anton Ph. van Harreveld, *Odour Regulation and the History of Odour Measurement in Europe*, working paper, [https://www.env.go.jp/en/air/odor/measure/o2\\_1\\_3.pdf](https://www.env.go.jp/en/air/odor/measure/o2_1_3.pdf) [accessed 19.4.2021].

62 Mark Jenner, *Follow Your Nose? Smell, Smelling, and Their Histories*, in: *The American Historical Review* 116 (2011), pp. 335-351.

chunks. The performances involved in these experiments merit comparison with the practices of nineteenth-century sanitarians. As they flitted in and out of buildings, alleyways, and streets during the course of their perambulations the noses of inspectors were constantly exposed to new and varied atmospheric states that »assailed« and »stunned« them.<sup>63</sup> The experience of disgust that resulted was the product of crossing physical thresholds as well as physiological or social ones: smell became knowledge through forms of emplacement.<sup>64</sup>

One critique of historians who deploy narratives of deodorization and the concept of the threshold of olfactory tolerance is that it emphasizes structure over agency, the group over the individual, and therefore tends to operate at a level of generality or abstraction. Historians tend to claim a general lowering or heightening of tolerance across a social class or, indeed, whole societies.<sup>65</sup> The concept of the threshold is, in history as in psychology and odour regulation, a generalizing, abstracting, and norm-defining one. Thresholds create a normative nose, an abstraction that is made to stand in for and frequently effaces the real noses that have to breathe in atmospheric impurities on a daily basis.

For a contemporary example from the UK we might turn to the recent campaign centred on Walley's Quarry in Staffordshire. The quarry is a landfill site located next to several areas of housing and the stench of hydrogen-sulphide from the site has been the subject of a »Stop the Stink« campaign from local residents. Here thresholds of olfactory annoyance and particulate matter assessed by monitoring stations were made to stand in for the experiences of the local community who had actively complained. The measurements of thresholds and assurances from Public Health England that the emissions could not cause long-term illness did little to assuage the concerns of a community who were »genuinely frightened about what is in the air they breathe«.<sup>66</sup> The sense of diminished health and impediments to normal everyday life were part of the »qualia of annoyance«: a feeling that one's body is out of sync with the spaces it inhabits and an experience of long-term transformative exposure that has been described as the »chemical sublime«.<sup>67</sup> These conditions were not amenable to forms of knowledge that required the building of thresholds *between* atmospheres instead of the experience of people dwelling *in* them.

The lessons we can learn from the long history of olfactory thresholds and their contemporary application is that historians would do better to think against the concept, engaging antagonistically and critically with their historical and contemporary deployment, rather than taking the threshold for granted as a tool that we can use to describe the noses and sensitivities of past or present actors. This involves taking seriously what it means to live *in* and *with* odours. It is perhaps ironic that the inventor

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63 Tullett, Re-odorization, Disease, and Emotion.

64 Joshua Reno, Beyond Risk. Emplacement and the Production of Environmental Evidence, in: *American Ethnologist* 38 (2011), pp. 516-530.

65 Bruce Curtis, »I can tell by the way you smell.« Dietetics, Smell, Social Theory, in: *The Senses and Society* 3 (2008), p. 8.

66 Hansard, HC Deb. Vol. 695, cols.823-832, 19th May 2021.

67 François-Joseph Daniel, Odour Pollution, Sensory Impediments and the Social Meaning of Being Annoyed, in: *Ethnos* 85 (2020), pp. 799-818.

of the olfactometer, Hendrik Zwaardemaker, noted that we »live in a world of odor«. <sup>68</sup> Smell studies scholars need to restore the worldly relationship with smell in all its diversity that was severed by nineteenth-century experimental psychology. That means getting over – and beyond – the threshold.

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68 Hendrik Zwaardemaker, Les sensations olfactives, leurs combinaisons et leurs compensations, in: L'année psychologique 5 (1898), p. 203.