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How a Whale Becomes a Molecule: A Geography of Modern Olfaction

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How a Whale Becomes a Molecule:
A Geography of Modern Olfaction

By

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Committee in charge:

Professor Jake Kosek, Co-Chair
Professor Michael Watts, Co-Chair
Professor Rosemary Joyce

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Abstract

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This dissertation, *How a Whale Becomes a Molecule: A Geography of Modern Olfaction,* argues that the sense of smell is a material relation and that it evolves through a set of geographic processes in distinct places and times. I follow the transformation of ambergris, a whale metabolic aberrance, into its chemical articulation, Ambroxan, to show how an evolving political economy mobilizes epistemic practice, iteratively conditioning the nature of olfaction. I explore the modern sense of smell as an ensemble of human industrial affective processes: first in the context of American imperial whaling through which marine life becomes entangled within several scales of commodity rendering, then through the embodiment of ambergris in practices of social-spatial hierarchy relative to both hygiene and class in 18th and 19th century France. I then focus on the translation of these imperial and industrial values into a consolidated olfactory paradigm wherein 'the nose' in the perfume industry deciphers and authorizes material identity, creating the possibility for chemical fungibility.

In showing how the processes of rendering ambergris are coterminous with knowledge systems that rationalize, commodify and reproduce it, I posit that 1. objects are assembled through the distinct practices and are inseparable from the political life in which they're embedded; and 2. that 'the nose,' in its geographic instantiations, is produced as a stable arbiter and means of knowing the world, and is conscripted to connect objects in the world in a certain way. I show that *there is no essential object or character* to things and that material affects are objects of flux, whether squid spawn or fossil fuel, and their reverberation depends on the durability of bodily affects alongside the material, semiotic codes into which they are trained.

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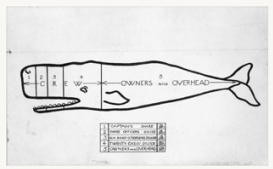

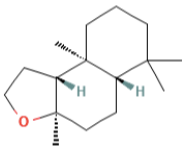

Acknowledgments

I arrived in Professor Jake Kosek's office receptive to an emergent fat glimmer in my eye: a capacious library of thought bringing W.E.B Dubois, the Natural History of Bees, Walter Benjamin into one space. I thought, I can follow my inquiry here. I can generate a lot and travel in many directions, and Jake has been an unflinching guide—one of the first in my life to help me anchor and continuously refine that expansiveness. I am grateful to Jake for that moment of reflection and the many that would follow. Thank you for seeing me, and saying yes to me, and also 'No.'
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And yet it multiplied in the richness of generational providence. Professor Michael Watts, who was Jake's advisor and *mestre* (to use a Brasilian word for High Teacher) of the department when I arrived, agreed to work with me too despite the appearance of regional and thematic difference. I say 'appearance' because it is beside the point. Michael has one of the most voluminous, alert and vibrant minds I have met. Someone once described it to me as like a hummingbird: swift, thorough, cartographic, exact.
At the institutional scale and the level of the sentence, your advice has been exactly precious. It has been a true gift to learn to parse the world through your example, and I am challenged to think of anyone who does it with more elegance. Thank you for the exacting feedback. Thank you for the breadth of consideration, and for being a person to look up to and trust.

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ally from each of you. You have schooled and aided me with your upstanding commitments to our evolving collectivity.
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Thank you Manuela, my sister, for your unobstructed strength and the beauty of your softness. Thank you Andy for being such a bright model of courage and power. Thank you both for Isaiah.

Both my parents had PhDs so I had the early luck of intellectual role models. They were both first generation Americans (my dad was Brasilian and was given a green card when I was in middle school) who thought deeply about class, power, and political life. My mother is an anthropologist and my father was a Marxist-economist, so Geography at Berkeley was in many ways a perfect love-child institutional match for me.
Being their love child is the literal gift of my life.
I am boundlessly grateful to both of them for their love and encouragement, their support of my big curiosity, and the push to always work harder in all of my creation.

Thank you mãeinha, Dr. Leni Silverstein, for the lifelong gift of a mother's devotion, for being the sweetest and most rigorous mirror, for your advocacy and your love.

I dedicate the completion of this work to you mama;

And to my father Dr. Jonas Zoninsein, whose echo of *discipline, focus,* motivated many aspects of this pursuit, yielding so much more richness in turn.

In the surprising continuity of the university, being a graduate student and scholar is still an adverse economic condition. I am grateful to have received support from the Center for Craft, Creativity and Design; the Evelyn Pruitt Fellowship from the Society of Women's Geographers; the Georges Lurcy Charitable and Educational Trust; and the Mellon Foundation/ACLS. Much of this work would not have been possible without you. Thank you.

Introduction

Ambergris is a pungent waxy mass derived from the belly of Sperm whales and used in perfumery for its olfactory performance as a marine-mysterious scent note and durable fixative. Composed of squid beak and digestive fluid, ambergris assembles by compaction in the lower intestine of less than 1% of these world pelagic mammals in the coincidence of their feed routes with squid spawn season. Ambergris is a rare, bio-geographic, metabolic condition.

Sperm whales have the longest intestinal tracts of any animal, measuring just less than 1,000 ft in larger creatures. Amongst mammals, sperm whales are epocho-taxonomically new creatures like cows that walked back into the ocean; their intestines are organized in related ruminate patterning with multiply-tiered stomachs. The first has thick muscular walls that mash their food (whales do not chew) and secretes no gastric juice. Digestion takes place in the second, from whence most unprocessed cephalopod parts are ejected, a dynamic that has long instigated confusion around the origin of ambergris as whale vomit. The tiny calcareous spikes that do pass the second intestine precipitate the mass's lipidinous formation in the hindgut. Ambergris begins to form as the culmination of an ocean nutritive-digestive process—an improvised assemblage.

Ambergris becomes disjoined from the whale through various paths of excretion and death. When the mass grows too large for regulated digestion, the whale dies. Its bones sink, flesh dissociates, and the mass is released to gyre and doldrum. Floating at sea, it brines in the mixt and oxidizes in the sun. It is culled, bobbing, or washes ashore aged and pale, a vague detritus.

The object has long been rendered forth for social use through the hunt. Ancient Egyptian recipes formulate it for spatial conditioning as incense, and old Chinese materia medica texts name its employment as an aphrodisiac (Aftel 2014; Cooley, Toledano, and Yildirim 2023). Middle Age plague-ridden Europeans summoned ambergris to override the airs of contagion (Corbin 1986a; Levitt 2023b). It gets encoded into an olfactory language of social hierarchy in the French Court under Louis XV (Stamelman 2006a; Le Guérer 1992). The exceptional conditions of its maritime and shoreline harvest are then marshaled towards a mystical sensory-atmospheric code of social differentiation.

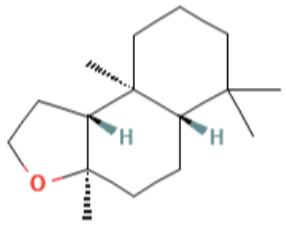
Sometimes, and with increased intensity in the mid-19th century Atlantic, ambergris is culled directly from the whale's body. Flat shank spade and blubber sheath, the dead body is severed into natural scientific units with corresponding economic values. These units and values are parsed on land for utility in an early colonial-imperial American economy. Young, direct-extraction ambergris is dark and dense and found in the belly by the pound, exuding a robust olfactory aura of oceanic excavation. Ambergris becomes a weighted, magical commodity for market exchange.

At the same time, the perfume industry is formalizing in France, and ambergris is appraised—its sensory, social, and financial aromatic qualities stabilized at once. Its scent profile is manifold: saline, mineral, leathery, smokey, warm, and honied. This consolidates as a lexicon about essence, accommodating extractive technique variations and broad functions in perfume composition. The values of ambergris are exercised in perfume compositional affects like

fragrance stabilization on the one hand and volume and textural enhancement (shimmer) on the other. Ambergris is fastened as an essential set of olfactory activations.

Ambergris sparkles, or is entrained for such affect, within an aromatic-material pedagogy. Today, it sells today for some $67/g, though circulation is taboo following the establishment of marine mammal protection acts. It sparkles through covert black-market flows into economic registration by appraisers in France, and across sustainability rhetoric in fragrance corporations proposing adjacent, mass-reproducible formulations of it. Its historic mystique is charged with new articulations of scarcity as the fragrance market that rations it grows.

Chemists rise to the scene in a proposal to liberate ambergris from ecologically dependent conditions. Fragrance corporations generate proposals for equivalence in petrochemical form—alongside E. coli and clary sage—as in the case of its industry-celebrated chemical reproduction, *Ambroxan,* which appears extra-natural. In patents and other competitive proprietary institutional forms, Ambergris is articulated as chemical formulas and graphs, new lexicons of essence at infinitesimal scales. These forms are confirmed through moments of sniffing by trained experts who certify its olfactory similitude. *Ambroxan* is born by global fragrance corporate giant Firmenich Flavor and Fragrance in the 1940s, and ambergris becomes an operational essential chemical form.



Ambroxan is defined as a "diterpenoid and heterocyclic compound derived from sclareol." It is designed to diffuse fragrance, add intensity, and preserve "the silky, transparent crystalline characteristics of ocean spray."(Ncube, Steenkamp, and Dubery 2020).

I have always been interested in how smell wakes up different kinds of consciousness: how it carries information about an environment and events within it; about bodies, their habits, choices, economic and identity orientations; the potency of presence it can incite, and how that intimate place-ness, place creation, links so many other ones. When I began thinking with smell, I was startled by how much material world history was being enacted, everywhere all the time, in the most subtle way. I started to think about smell as the condition for so much embodied knowledge and affect.

I started questioning how smell made knowledge about the world and relations within it in continuity with the ways it resulted from specific historical exertions of power and knowledge. This way of thinking opened up new ways of considering identity, essence, and relation—similarity and difference. I realized, in a new way for me, how those notions were so deeply embedded in and dependent on other things and moments for their making.

This dissertation emerges from that dwelling. *How a Whale Becomes a Molecule: A Geography of Modern Olfaction,* sets up an argument that smell is material and changing and that it evolves through a set of geographic processes in distinct places and times. It suggests that the sense of smell is relational, proposing that the transformation of a thing (a whale, ambergris) into something else (a molecule)—the forging of a relation between the two—reworks the nature of the sense. The positioning together of these two entities, biological and chemical, highlights the epistemic trajectory as both aggregative and mutually reinforcing in the creation of equivalence. An evolving political economic orientation conditions the mobility of this olfactory nature.

I focus on the coming into being of objects (the object ambergris), epistemology, and senses together through practice in distinct places and times. I thus explore the modern sense of smell as an ensemble of human industrial affective processes: first in the context of American imperial whaling through which marine life becomes entangled in commodity production. I then consider the embodiment of ambergris in practices of social, spatial hierarchy in relation to18th and 19th-century hygiene and class regimes in France that charge the imperative for its reproduction. The second part of the study focuses on the translation of these imperial and industrial values into a consolidated olfactory paradigm wherein 'the nose' in the perfume industry deciphers and authorizes material identity.

It is as a material relation/relation with matter that emerges through practice in time and place, that I say the senses are geographic. The processes of rendering ambergris are coterminous with knowledge systems that rationalize, commodify and reproduce it. When I use the word 'materials,' I mean substance, matter, and physical form; I also mean its ensemble of affects, sensory and semiotic.

Similarly, by processes, I mean institutional, economic, discursive, biological, chemical, and phenomenological ones together. The boundary of each is immediately undone by the naming of the next: the defining contours of biological objects are almost always shaped with economic motivation; the discursive is always entrained through expressions of social positions. The making of units is always a political and situated classificatory activity on the whaling ship and in the lab alike, often delineated according to contemporaneous postulations of utility and value.

I use 'material' and 'matter' somewhat flexibly alongside *materiality*, by which I pick up a recognizable reference to labor and structures of historical power through which the world as we know it is made/known. Objects and their affects are interdependent upon the conditions of their formation, and this is at the heart of what I mean by *relation* in the entire text. When I write about ambergris, I am also referring to its connected sensory domain, designations which oscillate in an ensemble of geographical relations. This differs from other accounts of ambergris and the sense of smell.

Ambergris is rendered a mystical, essential, biological, and ultimately stable object across almost all textual accounts of it. Conventional narratives like *The Natural History of the Senses* by Diane Ackerman recite the stability of object-subject separations and narrate objects trans-historically for their cute or intriguing affects, even as the material conditions change. History is composed by the chronological ordering of things as they happened 'naturally' to animals, plants, human animals, and chemicals. Ackerman's narrative absences all colonial and imperial

exertions of power that create the conditions for experience/knowledge about the 'wonders' centered in the text. Flowers are biologically reified and made innate as a transhistorical reference to sex and fertility; molecules are obvious entities that impact a certain brain. (Ackerman 1991)

Ackerman cites J.E. Amoore's stereo-chemical theory of olfaction, a neuro-physiological assertion of the finite bounds of the sense. (Amoore and Beidler 1971)[i] Amoore maps connections between geometric shapes of molecules and the odor sensations they produce, a knowledge system that depends on agreed-upon metaphors and proprietary visualization structures that delimit what component parts look like and how they behave. The predictive function of the 'lock and key metaphor' is central to Chandler Burr's popular book *The Emperor of Scent,* which elucidates that glorified metaphor's operation as the trial-and-error scientific foundation of a multi-billion-dollar industry. Burr's portrait of a bio-physicist within the industry politicizes knowledge about the sense by situating it in its charged industrial circumstance, thereby providing a fresh and more rigorous perspective, one of the few geographically critical mainstream accounts.

Relativity often emerges as a general heuristic in anthropological accounts (see Classen 1993; Howes 2005), and even in colonial contexts, the conditions of assemblage of differential space and olfactory-respiratory encounters are secondary to the identification of *the fact of*—rather than a *practice of*—difference. Another way to say this is that a focus on relativity can obfuscate the ways in which cleavages between objects and subjects come to matter.

Works like *Floating Gold: A Natural and Unnatural History of Ambergris* and Annick Le Guerer's *Scent: The Mysterious and Essential Powers of Smell* situate the object and the sense in the specific historical contexts that endow value. Such accounts are useful in naming a complex milieu that creates possibilities for aromatic worlds and interpretations; they name actors, landscapes, and state propulsions—but there is another step to make. The sense does not merely exist but is responsive to historical impacts and modifications. The sense is quite literally constituted; it is made by and expresses the processes and relations of its formation. How smells smell, when, where, with what intensity, and with what affect are themselves historical.

In *Ambergris as an Overlooked Historical Marine Resource: its Biology and Role as a Global Economic Commodity,* authors Brito et al. highlight the production of the medical value of ambergris as an imperial condition of circulation and commodification. Demand and/or value here depends not only on state powers exercised in extra-territorial global space but also through country-specific legislation that restricts its circulation. As these national and market formations of value based on rarity increase with a global rise in oceanic pollution and species decimation due to hunting by setting a historical economic scene for the social valuation of ambergris and the sense regime it activates, Brito et al. also simultaneously inure ambergris as a scarcity condition that requires synthetic reproduction. (Brito, Jordão, and Pierce 2016)

Perhaps closest to the geographic analysis I am proposing herein, *Natural Things In Early Modern Worlds* (Cooley, Toledano, and Yildirim 2023) is unique for discussing its making as a natural thing, as a natural historical object. Further, Cooley and Biederman name this active construction as a necessary part of making it a commodity, thereby tying the natural historical

acts of ordering to economic history. Their study takes up the theme of scarcity, as highlighted in Brito above, but here not merely as a natural condition, but rather one used to express class in association with access to goods and medicine. Congealed with this social value, ambergris becomes a site of state power in attempting to curtail class divides through scent practice.

Where that account focuses on ambergris in 16th century Italy, it is akin to mine in exploring how curative/medicinal properties are articulated in scent and productive of a kind of olfactory rationality. Ambergris moves from the ocean into a fragrance taxonomy at the end of the essay into a new classification system as mineral. Its status is porous and mobile, conditioned by the social-political moment that defines and redefines its value. And through and through, the nose is the arbiter of where and how it lands. In a side comment on the social value of ambergris even as it becomes disengaged from the ocean milieu and object, their essay surfaces a nuanced trajectory of this. On page 119, the authors recount:

> In the market place as in natural histories, ambergris was subject to great flexibility. In this way, the fluidity of amber's identity extended beyond abstract taxonomies and into the practical realm: a woman could walk into a local apothecary and buy herself some ambergris, or rather some substance labeled *ambracan*, with the intention of whipping up some homemade perfume later. However, she never really knew the contents of her vial. The essential concern was the scent with which her peers would associate her.

I have started to explore some ways in which olfactory values themselves, however entrained, are in flux. Ambergris, a market condition and subjective relation, is defined in its circuitry by the historical terms of its olfactory utility. Both essence and utility are unbound, introducing critical questions about the relationship between value and the sense of smell, the sense and various notions of value. In highlighting how the identity of matter comes into being through use in specific historical contexts on the one hand and the ways in which epistemological order is both shaped by and affects such use on the other, this essay underscores my arguments that 1. neither ambergris nor the sense of smell is essential, and that 2. neither are separate from the conditions of their making—whether produced natural-historically, via commodity labor, in social rituals of differentiation, or through practices of olfactory taxonimization.

In this review of some of the literature on both ambergris and the sense of smell, a final and perhaps most dominant frame for studying it emerges within another scientific mode that, similar to others, champions an original bio-chemical composition—this time as a fundamental backdrop for distinguishing essence as chemical. Gunther Ohloff, a prominent German fragrance chemist, asserts the identity of ambergris in an olfactory-biological logic, where the aroma of ambergris is a deterministic result of the action of sunlight and floating in waves containing oxygen, which is the condition of the decomposition of the *stercoraceous indole*, the fecal note in ambergris.

In the chemical analytic frame, Ambergris becomes an essential function of the 'triterpene alcohol ambreine, together with a series of sterols of the cholestanol' type (Janistyn, 1941; Lederer, 1949, 1950). Identified as a chemical object of splicing, it undergoes redefinition in possible ratios of substitutions, fractions of solubility, intensities, and percentages of tincture and diffusion. Its essence is made in composition for its specific utility (olfactory character and fixative performance).

Each of these accounts comes from a distinct position, often an over-determinative one that divests the account from a fuller history of its becoming, bracketing the processes and politics of its making. My take is different. In the following pages, I attend to the various labors of the formation of ambergris, showing how the object is a mesh of interdependent relations. I argue that the times and places of enactment of those relations change the nature of the object. Both time and place are interdependent with the sense.

In tracing the continued geographical production of ambergris, I reveal the fiction of stability of things across time and place, destabilizing the notion that one object might be more 'real' (ambergris). Ambroxan, too, is a relation made in a specific time and place. I argue that ambergris and Ambroxan are entirely different, not because they are real or not real, but precisely because they are assembled differently in other historical moments and places, and through distinct practices of making. And I show how the production of their relation, too, occurs in time and place.

The central points that carry through the subsequent chapters are thus:

1. Affect objects are assembled in specific ways and made through the practices of their use. Objects are inseparable from the political life in which they're embedded.
2. More specifically, 'the nose,' is produced as a stable arbiter and means of knowing the world, natural, chemical, and olfactive. It is conscripted to connect objects in the world in certain economic, industrial, and political processes of making. The nose creates equivalence in a way that seems timeless and given but is actually made through the practice by the human and non-human forces that assemble it.

The conceptual arc of this thesis spans pre-modern, plague-time Europe, wherein ambergris was valued for protection in a spatial, miasmatic theory of disease as well as for social differentiation through its rearticulation as the patented Ambroxan molecule forged by the Swiss corporation Firmenich Flavor and Fragrance in the 1940s. The highest frequencies of activity occur between the height of the New England whaling industry in the 1850s and the emergence of the first synthetic fragrance chemicals in the late 1880s/early 1890s.

The fullness of this account is not well attended to by a rigid temporal linearity or any historical narration that reifies time or place as a totality. Instead, by attuning to the conditions through which matter is segmented, the processes by which it congeals as taxonomy, and the material-discursive proposals by which it accumulates meaning—I consider matter for the ways in which it constitutes time, not just occurs in it.[ii] Meanings and moments, of course, carry over, even as they assemble in new ways. Each chapter progresses chronologically as a larger sequence, yet within each, time structures overlap, repeat and echo forth, mirroring the *epistemes* they engage (Foucault 2007).

Each chapter coheres around a set of anchoring themes:

Chapter 1: the new value conferred in ambergris through labors of extraction and commodification on New England whalers,

Chapter 2: the social and spatial difference that ambergris instantiates in its employment as a class and class-hygienic signal
Chapter 3: the sedimentation of the olfactory values of ambergris through perfume compositional practices and the expertise of the nose in a rising French regional industry
Chapter 4: the conscription of the nose in mobilizing taxonomic truth towards chemical reproduction.

Perfume's affective material power seems to be all about essence, and its circulation depends on that concept. The industry is built on such mysticism, and a $48 billion industry depends on it. Thinking about it geographically raises important questions about the ways in which value comes from the sense of smell: how affective capacities shape ideas of utility on the one hand, and the ways in which conditions of rendering objects structure the sensible/sensate on the other. Ideas about the composition of the world, relations of power within and enacted upon it (colonial, imperial, industrial), charged histories of hierarchy and health/safety, the exact composition of particulate matter—in scent, all of these play out in the very activity of breath.

With this geographical consciousness for the material contours of all things, I wanted to understand more about how practice: embodied olfactory, respiratory, artisanal, and laboratorial alike, creates things and creates them anew—both ambergris and Ambroxan as a relation. To understand both and their relation as a process, I needed to go to distinct sites of their historical assemblage.

To learn how multiple sensorial affective experiences with ambergris become arranged in its sensorial multiplicity and formalized across social space, I went to perfume school to learn how sensing in a particular way is entrained. I participated in courses that organized materials through compositional praxis founded on historical, affective taxonomies. I participated in courses at a preeminent perfume school focused on sensing and composing with natural materials in California; a mixed naturals and synthetics perfume school and network based in LA; and in Grasse, France, the global epicenter for perfume production and reference. In each, I learned how myriad, inhaled, swirling olfactory qualities were parsed through speech to create experiential consensus. I attached specific sensations to (selected) historical landscapes and social moments. I trained to viscerally detect differences in technological processing mechanisms within substances of the same material origin and to identify how to use that particular material manifestation (distilled essential oil, CO_2 extracted concretes, for example) in a blend. I attuned to each wafting in its expression of a specific geographical formation, in iconographic relation and corporate fabrication conditions alike. I practiced locating a designated identity as well as the enmeshment of many situated activities/orientations in each registration in smell.

I contextualized the information presented in sensory explorations with archival immersion in primary accounts, museums, amongst historical objects, visits to corporate laboratories, and interviews with a breadth of fragrance professionals. I read through selected whaling archives of the New Bedford Whaling Industry to learn about the specific forms of labor exercised to yield ambergris as a commodity from the body of the whale: techniques for excising it, weights and quantities of lots taken, mechanisms for evaluating it, subject positions emergent in relation. I visited perfume institutions in Grasse, France: the managing office for raw perfume materials circulation (PRODAROM), independent perfumers and perfume schools, early industrial

material production facilities, and the offices of ambergris appraisers. Each materialized a variation of mechanisms for identifying, valuing, and encoding the mass in social circulation. Visits to contemporary molecular genesis labs, fragrance production facilities, and interviews with chemists introduced the modern chemical-technical assemblage that articulated the mass both differentially and equivalently as a molecular affect today.

I thus develop a Geographical framework for attuning to the sense of smell as generated through specific material practices in particular times and places by tracing the processes and relations that propagate ambergris from the belly of the whale into a global molecular patent.

Chapter 1: *Combustion in a Pelagic Lab: Making Sense of Oceanic Extraction* opens with an exploration of the proto-scientific industrial conditions that create ambergris as a commodity. While the crude conglomerate preexists this early industrial moment of rendering as both a physical assemblage and as a social one in arcane historical references (I have read of it in circulation in China as early as the 8th century, for example), this chapter distinguishes the work of the whaling industry around the 1850s in articulating ambergris as a stable modern commodity unit for the rising French perfume industry.

The mid-nineteenth-century oceanic imperial frame and the moments of its derivation from the body of the whale provide the foundation, the base note, of the entire story. A base note orients the entirety of a perfume, introducing and securing the deeper themes that resonate upwards throughout the whole profile. This geography of Ambergris is anchored in the imperia, extractive taxonomic conditions of its partition from the body of *Physter Catadon*. I engage this history through archives written by ship logmen and primary texts, through objects organized at the New Bedford Whaling Museum, in a particular 1904 magazine narrative describing forms of labor and the hunt with photographic accompaniment, and some musings on *Moby Dick* (Melville 1993). Across these resources, I inquire into the labor conditions and orientations by which ambergris is spliced into an object form of value as the whale body is digested industrially on the ship deck. The addition of the *try-works,* a cauldron of sorts, on the whaler deck facilitated the speed of bodily segmentation as well as increased its shelf stability, increasing accumulation possibilities and time at sea while also exactly substantiating new Natural Historical, biological principles part and parcel to the production of economically viable objects.

The chapter oscillates, then, between the 1904 narration of a whale hunt inflected by my own read of the human economic exigencies on the ocean on the one hand, and subsequent parsing of the development of biological taxonomy and whale body commodities on deck; I anchor a larger story about the development of the modern sense of smell in this moment of scientific and colonial economic production. I argue that while ambergris already existed as a sensory pleasure for European aristocrats (see Ch. 2 Object Affects), the new scale and processes yielded the matter as a new social relation.

Theoretically, I think the senses 1. alongside commodities in their mutual, historical formation, (Tucker, Marx, and Engels 1978) 2. for the way that scientific apparatuses shape the possibilities of matter quite literally through the shapes/sizes made by spade, the material qualities and worldviews they delimit (blubber as lipid, lipid as combustible, combustible as day's extension in urban space via street and house lamp, for example)—and the social relations they instantiate

(boatswain, captain; merchant, tax executor, etc.)(Barad 2003); and 3. as generative of taxonomic orders and relations that reify their limited 'universal' understandings, absenting contextual motivations, and structures of power of their formation (Freedberg 2003; Burnett 2010; L. Schiebinger 1993). These three theoretical orientations undergird the entire dissertation. More expanded exegeses appear, however, as endnote references rather than as central textual features to preserve the flow in each section.

In Chapter 2: *Object Affects: Social Space,* I study the history of olfaction in constituting ideas about space and relations within it—the composition of the atmosphere, the status of bodies, the safety and hygiene of human bodies in proximity. I follow ambergris as it wafts from the self-sequestering imperial landscapes of the French court around the 18th century through to its commodification in the households of the petit bourgeoisie in the 19th following the increase in its circulation availed by the whaling industry. I trace various mechanisms by which the sense of smell charges political, spatial life in socially differentiating ways.

I focus first on how the concept of miasma and the logic of airborne pestilence inform a politics of emotion that shapes regimes of spatial and bodily composure. I look at how it is taken up through the wafting of fragrance by the aristocracy. I then trace how both the fear of miasma and aristocratic emulation carry through to new class patterns of scented commodity use in domestic ritual around the 19th century. Olfactive aspects of class become interpolated as a kind of human essence wherein precepts of public hygiene iteratively yield new commodities and popular sensory experience part and parcel, transforming what scent encodes in normative practices of daily life. These moves help me identify the conditions for the emergence of a sensory commodity regime that orients the rise of the perfume industry and ambergris within it.

As part of this inquiry, I track the life worlds of several olfactory objects carrying ambergris that, in their historical usage, imbue ambergris with a set of discursive valences. In pomanders to ward off disease, the perfume recipes of Marie Antoinette, and many new household cosmetics, ambergris accrues qualitative values that both mark and are marked by specific class geographic conditions. I consider then the value of ambergris explored in the previous chapter with its nuanced endowment in spatialized patterns of congregation at Versailles and in Paris, and in the development of new ritualized scent use and patterns of distribution for the bourgeoisie. The ambergris-scent objects enlisted in this chapter work on the sensate body materially and semiotically together in constituting not only notions but practices of difference through ambergris and the sense of smell.

The accumulation of extracted materials informs a posture, assumed as an elevated endpoint of a coordinated labor effort, a boastful harvest atop networks of cultivation, processing, and circulation elsewhere. In this regard, I think of perfumery as a daily self-administered affective practice that defines and normalizes bodies and spaces in their social acceptability (gender, cleanliness, class), which is made possible by previous stages of inter-related imperial encounters, extractive labor regimes, and epistemological practice.

Contemporary theorizations of *affect*, defined here as an individually felt political force that shapes group ideas, beliefs, and practices at a collective level, help me theorize how object relations shape political life. Affect accounts for the out-of-sight forces of power that move

through all things and shape all relations in one way or another, and names qualities of political activity that produce and unite people, places, and things through pulses of perception and emotion.[iii] Theorization of affect identifies the human body as providing the situation of encounter, where the body is a "nexus of finely interlaced force fields," (Highmore 2020, 119)—a locus for experience, meaning, and knowledge together. Somatic experience expands beyond notions of individual emotions into the domain of the political, in open composition with both material and immaterial life. Affect provides a flexible concept for thinking the senses through as a milieu for political activity that reverberates and, importantly, produces across individual and collective registers.

In Chapter 3: *The Nose that Composes: An Industrial Sensory Landscape,* I explore the production of ambergris as a scent note and fixative for a burgeoning industrial perfume industry as it rises in Grasse, France in the 19th century. I follow ambergris post whale excision to Grasse as a critical site of its global appraisal and historic fragrance materials, processes, and narratives. I argue that, through the exercising of olfactory taxonomy, the nose creates conditions for material fungibility, allying matter with the opportunity for substitution beyond previous historical, conceptual material registers. I situate the rise of perfumery, in the topographical-historical conjuncture that conditioned its meaning and reproduction. I specifically explore how Grasse retained its prominence through grounded technological development and consolidated production despite regime shifts in material sourcing and processing through the expertise of the nose. I interview the head of the French perfume materials syndicate today and an ambergris merchant to learn about the continuing olfactory evaluation legacy that supports and sustains the arrival of ambergris in France today.

In the second half of the chapter, I focus on the taxonimization of ambergris through perfume compositional practice to show how the nose mediates notions of essence, identity, and value across a spectrum of substances and rendering practices. Perfume, even at an industrial scale, is distinguished by the role of the 'nose,' *le Nez*, a designation of both the organ and head perfumer that depends on a set of discrete, micro, corporeal practices. In perfume classes, I study how olfactory matter is created through the sensory-taxonomic training of the nose.

By delving into the regional conditions that nurture the rise of the perfume industry alongside the taxonomic structures that bolster perfume-world claims & practices, I show how the essence of ambergris is produced as a function of the sense of smell. The multiple levels of codification of ambergris in perfumery both delimit its compositional use and value, and create an essential foundation for further material mobilization and re/interpretation, the focus of the final chapter.

The specific, situated practices of rendering olfactory matter (cutting in, dissolution) delimit knowledge concepts concerning the materials and the sense together. In becoming materials for fragrance production, inchoate commodity forms are designed for specific uses, making ontological cuts about what the thing is and can be.[iv] The formalized economic, olfactory aspects provide the contours of their utility and qualitative function. The nose's evaluative, knowledge-making, and productive function then underwrites most daily aspects of contemporary world olfactory composition.

Chapter 4: *Chemical Space,* tracks a set of scientific histories and institutional orientations that condition the possibility for ambergris to be recreated as a set of chemical essences, with specific attention again to the work of the nose in confirming material shift. Historical achievements of chemical synthesis in late 19th century France articulated a worldly molecular-essential palette conferred as shapes, as a set of bonds with relative fixed strengths, as the sites and conditions of their breaking, and the torques in which they spin. With the discovery of chirality, molecules came to be known not only by their structure but as a directional shape, the torque of which activates different affects in the body.

In its reterritorialization in the chemical laboratory, ambergris is translated into rational, regimented, repeatable units. This chapter studies the ways in which the molecule Ambroxan is employed as a corporate institutional and scientific philosophical entity, materialized in graphic, linguistic, and sensory practices that depend on attunement to embodied affects to direct and control molecular reproduction. In the making of synthetic, fungible chemicals, the nose must assimilate new ingredients into previous epistemological classificatory models; the rendering of the molecule form then depends on the embodied mediation of forms learned to be felt in spaces that appear to be acontextual, non-biogeographic laboratory milieux of technological isolation. And yet, as on the ship, these manifestations are rife with historical, situated contexts.

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It may seem unsurprising to argue that objects, and the senses, are interdependent, emergent from a broad milieu of historical relations. Yet, the implications that 1. *there is no essential character* or that essential characters are made and up for remaking and 2. that these makings are coincident with the body are still rare. Of course, many feminist materialists have elucidated this (see Haraway, Butler); I am drawing upon that tradition.

Despite these potent analyses, object essence and bodily unity/separation permeate most thought and interaction. This contemplation of the making of the essence ambergris, and the forging of its relation with Ambroxan, reveals the truly complex processes of producing equivalence. Where Ambroxan may appear obvious in its formation being from a lab, ambergris must be situated in ship-based mass industrial slaughter, in masc adventures on the sea. Neither are taxonomically fixed things, and their essence and purity must continuously be remade—in what they do versus what they "are" to stabilize the possibility of their correlation. And yet, as we have seen, the object is constantly changing. Therefore, so is the sense.

Writing a dissertation on the senses, on the sense of smell in particular, has taken me almost directly to the margins of academia, to the ripe centers of new breath and new thought—most presently in the theorization of affect, disability, toxicity, gender, and decolonization of the university.[v] There is, then, a soft encouragement that dwelling on the dynamic relationship between materials and senses can yield broader, if not surprising political and environmental histories about relations with the world that have been otherwise camouflaged in treating the senses as a given.

Chapter 1

Combustion in a Pelagic Lab:
Making Sense of Oceanic Extraction

Making Sense of Oceanic Extraction

The sperm whale gallstone, ambergris, harvested across gyre and wrangled through bodily splicing, sells today for more than $60/g as both a scent note and fixative performance in modern perfumery. Its circulation as a commodity is taboo following the disintegration of world-historic whaling routines—here, the imperial assertion of an early United States in the 1800s—and the subsequent formation of marine mammal protection acts curtailing such commerce. Grey-area hunters in Ireland, New Zealand, and India scour beaches with oceanic truffle dogs and attunement otherwise to this visually vague treasure. Covert appraisers in France steward its registry as a luxury perfume ingredient into the social space of contemporary breath.

Knowledge and value are made from the whale through relations surrounding its slaughter. Ambergris is part of what is made in these relations. Nature is made into a commodity, and the meaning of the commodity also makes nature as it emerges from these relations.

Beyond the distinctiveness of its origin and affective charm, ambergris is a potent geographic object for the ways it embodies the labor of a particular moment in western oceanic imperialism and industrial development, and a conjoined set of scientific taxonomic truths codified therein. It is furthermore unusual and valuable as an object of geographic thought for how it expresses such economic and scientific productivity through and as the sense of smell. The status of ambergris in the perfume industry—institutions that mediate smell in contemporary life under capitalism—rouses an awareness that the sense of smell is not a timeless condition in the world but comes into being through human activity in relation with materials.

In this chapter, I develop the first historical pass in the larger arc of an argument that the sense of smell is produced geographically— that is, through discrete forms of labor and practice in situated places and moments. I tease out a perspective on the senses as a human-material relation, processual and dynamic. I locate the New Bedford whaling industry in the 19th century as one possible derivation point for tracing the development of a modern, global olfactory sense. I explore how this sense comes into being through imperial practice that braids together the hunt, taxonomic segmentation, and commodity production at a newly industrial scale. In tracing the contours of a particular time and place of the making of ambergris, I examine the interdependent nature of both object and subject through the sense of smell, elaborating the ways in which the formation of the olfactory sense participates in the making and remaking of relations in and to the world.

I interpret the New Bedford Whaling Industry as a site of commodity scaling activity through which new epistemological relations are rendered alongside olfactory materials. I focus on how the body of the whale is parsed as a composite of economic objects according to the exigencies of early industrial capitalism in colonial oceanic America, the values of which contribute to the establishment of an early American Natural Science.[vi] I study early attempts to routinize/ maximize the separation and gathering of ambergris as it plays out on the ship deck at the height of this industry. With the addition of the *trywork* on board the ship deck, formative techniques of biological dissection render the body of the whale into a bundle of commodities capable of increased circulation as human-affective entities. In this movement, I identify the ship deck as a pelagic, proto-laboratorial space. I trace the broad conditions through which this affective entity becomes available for fragrance design at a large, i.e., increasingly bourgeois, scale.

In short, I argue that the means of production of commodities and the evolution of sense are not only conjoined but mutually constitutive. I describe how the nascent American colonial industrialization process on the whaling ship—the identification and separation activity of that aromatic, congealed digestive mass—is the exact condition of possibility for the establishment of a bourgeois European sensory palette (see *Ch. 2: Object Affects*). I show how the taxonomic and physical rendering of ambergris also exactly conditions the modes and orientations of generating synthetic aromatic molecules (see *Ch. 4: Chemical Space.*) By exploring some of the particularities concerning ambergris's 19th and 20th-century productions and circulations, I offer a broad methodological exegesis of the formation of the senses as a material, geographical process. The practices for transforming matter on the ship deck comprise the foundational storyline of how the modern sense of smell is created, and created anew. [vii]

My argument that the olfactory sense is produced geographically builds from the gen that 1. aromatic objects are produced rather than merely found; 2. the production of a sensory object yields subjective values simultaneously; 3. such production occurs materially and discursively at once, and 4. the specific labors and the knowledge of their objective making are inflected by their situation within a political economy.

I hope to refresh a perception of the senses as dynamic, emergent, exactly relational—and constituted as much by global material history as by the present milieu. This may be obvious for any reader that finds themselves again upright against a standardized plastic seat in a franchise workspace, attentive just now to the haptic return of milled paper or mined coltan, responsive to the subtle aromatics of whatever form of hot everyday drug gleaned from a half-traceable afar as they waft in a nearby shaft of light. Yet, in daily thought behavior, conditioned so thoroughly by some performative gentlemen in durable, authoritative architectures many years ago, the unity of the human body and the secure nature of things before us are taken for granted, on repeat.

The oceanic imperialism anchored in early New England ports sets the conditions for long-term US global maritime power, with ripples into the twentieth and twenty-first centuries as atom bomb tests in the South Pacific, oil drilling in Alaska, and transnational oceanic occupation by Amazon containers; on much of the world's coasts, we can trace in some way the presence of American whalers and consuls sent out otherwise to protect American whaling (Shoemaker 2015). In the following chapters, I develop this history specifically through a more subtle legacy, that of the perfume industry, as the whale–and the legacy of power enacted through it—is transformed into a chemical commodity, a molecule.

Where my argument is less exactly literal in the tracing of taxonomic practice on the ship as it tessellates into taxonomic practice in the fragrance lab, I am interested in the ways in which orientations and relations on the ship deck, particularly in the frames of extraction and accumulation, shape industrial commodity science. I contemplate how material extraction on the ocean sets the condition for synthetic reproduction of olfactory materials first by investigating how the whaling industry provides raw materials for a broader olfactory palette and economy at a new material processing capacity and scale through the development of techniques, expertise, and authority that shape essential identity and qualities of matter. The conditions of value creation herein are inseparable from the orientations on the ship deck: the scarcity of ambergris

in origin; hierarchical classification of qualitative variations; exchange value in relation with other objects; and capital generated that gets infused into new material productions—each of which is articulated in new ways as historical material conditions evolve.

Framing this moment of industrial whaling in such historical progression helps us think human-animal and human-oceanic relations as a repertoire of material practices that are activated and performed in discrete situations and times. They are historically situated in their meaning as a repertoire, both productive anew when carried out in different places and moments, and plastic for reinterpretation. I argue (a la Burnett 2010) that historical techniques for producing knowledge about nature generate robust authoritative structures that condition ways of being and relating in the world and that these come to constitute a modern sensory condition.

A History of the Senses

> The forming of the five senses is a labor of the entire history of the world down to the present.
> -Karl Marx, *Economic and Philosophic Manuscripts of 1844*

In this oft-referenced quote, Marx puts forth a nuanced expression of his long durée contention that human history and the attendant articulation of nature are an industrial, scientific process. I open my exploration of the history of modern smell with this statement as it points directly to the unresolved and in-process nature of the senses. It is a generative provocation: in his materialism, Marx locates the formation of the senses precisely in relation to the production of commodities, and, therefore labor and power relations.[viii] Where Marx's explicit project in that essay (and beyond) is the emancipation of the laborer—their bodies and consciousness from regimes of power, alienation, and impoverishment—his highlighting of the senses as historically emergent has been catalytic for my study, specifically my attention to qualities of labor and production, the physical practices and techniques for rendering matter into commodities, and the historical power relations, i.e., colonial and imperial accumulation practices, that shape what is sensed and how.

In the next section and distributed across this chapter, I intersperse an account of the American whaling industry in the early 1900s with my reading, one shaped by Marx's thesis that the world is made and remade through economic-cum-social relations. In considering the routes, routines, and daily experience of whaling work through which ambergris came to circulate at a commodity scale, I read several whaling memoirs.[ix] Amongst the many accounts in the New Bedford Whaling Museum archives, Clifford Ashley's 1904 two-part commission for *Harper's Monthly* stands out for the way in which it apprised the public imagination with qualities of that particular kind of life at sea, and in relation to whale parts yielded (Ashley 1906). The Ashley account is particularly useful to me in its broader intention to make life aboard the whaling ship more accessible to American domestic households, presumably consumers of whale-enriched products including soap, candles, and margarine. In many ways, it sutures the imperial ideology of that time to embodied life in the domestic sphere.

Ashley, a New Bedford-born artist, and sailor, provided *Harper's* with a two-part, meticulously detailed account of the whaling process from dock to dock. His text provides a self-reflexive aperture into the day-in- and-out orientations, stresses, and attunement to the sea as a

fishing person and purveyor of oceanic things for daily economic life. As sentences go, each paragraph presents a lot of information about the ways in which oceanic acquisition towards commodity production shaped the experiences and practices of labor on deck. Rather than quote his text at length and describe it again for its information, a default stylistic referential practice, I have experimented with rewriting sections of Clifford's text to emphasize the subtle yet legible economic imperatives pronounced therein. Where academic writing often relies on a shrewd use of external evidence digested and framed anew, I offer this archival medium back, adapted, as a nuanced practice of critique itself. Ashley's adapted text appears in these pages in abridged form in an indented margin following custom for textual excerpts; further commentary on the historical conditions it reflects follows.

Telescopic Orientation

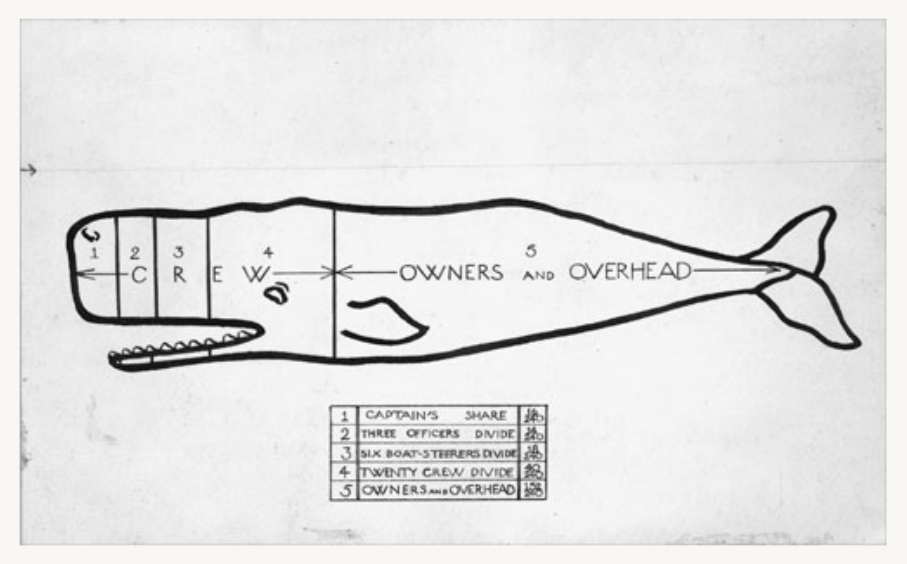
> Night and day alike were composed by anticipation of the whale.
> This tension was tested continuously—the swing of captain's satchel tobacco pulsed a prayer that sharpened our eyes. Jowl, rib, gut, each mate strained forward and against each other in the wet wind; hours passed in telescopic orientation. The diagram of its dissection shaped all things: bone spade, head spade, half-round spade. The ship's mast, berth, and bilge were rebuilt to sustain the weighted fat of our ambition. Sometimes we slept on the deck, piling beneath the arc of the dayboats, our fingers straining mid-slumber for a sturdy hold. Light and dark infused each other in the doldrums of determination across the bleeding season.
>
> I was chosen as if a dog on a bench, ribs jabbed, forced to bear my arms. Ever pull a boat? Where you from?" "Talk English?" Barked the whites as they selectively expropriated amongst our labor to apply towards the floating field. Our motley crew-- native, freemen, cape Verdean, pacific islander—expressed the pervasion of colonial administration, obviating us from what was now, presumably, their own settlements. Wherever whaleships ventured, new sources of labor were assimilated. The ship engrossed men from all the lands in a unified endeavor, resulting in a unique social community that operated by its own rules.[x]
>
> And yet, we all belonged to the ship in that time, and abided by its rules. On the ship, rank reigned supreme. Intent on profit, our captain anxiously repeated rank and materialized their fantasies of security in space by designating where men worked and slept, rehearsing who deferred to whom. Vulture amongst our common identity, the English legal system partnered debt with indenture, and many, but not all, natives who whaled in our time did so through coercion. Aboard, we abided fastidiously to the right of the lay.
>
> When the wind was dull, we tied knots and our conversation roamed. It always returned to the whale. "There are only two kinds of whale," Cooper would say. "One of 'em is the Sperm Whale; the rest of 'em is the other. The Sperm Whale, it's worth it for his oil. Only has teeth on his underjaw, like a cow, fights at both ends, has one forward spout, and lives only in warm country. Now Right Whale oil ain't worth beans; you hunt him for bone; 's got a whole sieve made out of slabs of bone in his mouth 'stead of teeth. Then he only fights with his flukes, but you bet he can use them pretty lively. Never known of a Right Whale's crossing the Line." Cooper would talk, and we would know again what we were after. Almost no part of the boat was untouched by his craft; the whole thing bent and strained to bring the sperm whale back our way.

In this excerpt, Ashley's observations traverse a range of economic conditions that structure the

hunt-specific labors and the conditions of knowledge that emerge in relation. Personal motivation, social status, bodily grade, speech acts, daily activity, species rank: all of these relations are fashioned by their exact situation within a whaling political economy.

The first image—the captain's satchel pouch—immediately contextualizes the scene with the effect of a profit motive driving asymmetrical power relations on deck. This motivation shapes embodied attunement to the ocean, each other, and activities of exertion, each manifest in daily behavior, objects at hand, all the material textures upon and through which all social life played. The conditions of labor color even the light of day.

In the second phrase, positional identity and status on the boat appear always already conditioned by previous imperial power relations. Social differentiation is apparent in speech acts between and amongst stations. The possibility of assembly, too, of coming together and the organization of space is enacted through geographical history. Unanimously, workers' bodies are identified and applied to work according to the physical exertions necessitated by the retrieval of a whale's body from the sea.



Lays (percentage of profit) ranged from about 1/15 for captains to as low as 1/250 or worse for cabin boys; a simultaneous class structure and human ontology is articulated again through the cut body of the whale.

The third paragraph speaks to the sociality both expressed and recreated in the division of the lay. The value of whale bodily parts is already assumed, made natural and logical, simultaneous to the distributions of value. Parsed in the whale's body are a legal, financial, and otherwise human power system. The final paragraph evidences the logic of value, this time differential in terms of natural classification and human interpretation of biological essence accorded by possible financial values rendered. The utility of Sperm whale parts is already registered and confirmed, and human energy is oriented in specific relation towards or with that exact creature.

Surface Attunements

> Mattering is differentiating, and which differences come to matter, matter in the iterative production of different differences.
> -Karen Barad, *Agential Realism*

Whalers equilibrate against the gunwale (upper edge of the ship) equivalent in lenticular strain, hopes substantiated by the horizon and its vaporous break. Coinciding location, whales rise for breath every human hour and a half. A two-meter column might beat up through the surface, skew left, and then punctuate again, percussively every 15 seconds for some eight minutes before submerging again, unfathomable...[xi]

In exploring ambergris as a material-phenomenological entity that comes into being through relational practices exercised around and upon it rather than as a fixed, pre-determined essence or biological object, I look to key moments in establishing a Natural or Biological History of the whale. Several texts, *The Natural History of the Sperm Whale (Beale 1839)*, *Sperm Whaling from New Bedford (Hall 1982),* and *Trying Leviathan: The Nineteenth Century New York Court Case That Put the Whale on Trial and Challenged the Order of Nature (Burnett 2010)* document a set economic mores that conditioned taxonomic principles of identification and experimentation in the 19th century. They each highlight the historical economic contingencies shaping knowledge about the being and body of the whale, emphasizing the impossibility of a natural history exterior to human activity. Cumulatively, they help me consider the multiply productive thrust of this near-gallstone into an exchange standard with gold.

My contemplation of the non-essential, becoming-made nature of this particularly affective composite is nourished by Karen Barad's discussions of the ways in which the boundaries—between human and nature, subject and object, thing and thing—are actively configured and reconfigured through practice (Barad 2003). Barad's articulation of the scientific apparatus[xii] moves my analysis beyond the obvious or taken-for-granted bounds of what is considered natural historic taxonomic practice in an attempt to more comprehensively locate the broader material-discursive exigencies of a political economy that splice ambergris into a luxury commodity.

Thomas Beale, the author of *The Natural History of the Sperm Whale*, was a surgeon to two British sperm whale ships in the early 1800s; he is celebrated for providing one of the first 'accurate' descriptions of sperm whale appearance, habits and general biology.[xiii] He is also credited specifically for developing notation on the lung capacity and breath cycle durations that anchor early cetacean science, as specific to the surface occupational condition of humans as they attempt oceanic harvest. Sperm whales dwell around 1 hour and 20 minutes underwater between surfacings for air, a rhythm whose oxygenic interlude constitutes most human-whale interaction time. Beale's notes on sperm whale life and behavior reflect the moment of co-incidence: "...the quantity of time that the full-grown sperm whale consumes in respiration […] as one to seven […] that a seventh of the time of this huge animal is consumed in the function of respiration." (44) The fact of breath, specifically breaths taken at the ocean's upper edge, provide a primary index for whale's presence, signaling the possibility of an encounter.

Melville used Beale's work as part of his research for the novel, particularly Chapter 32: *Cetology*. Melville quotes whaler Captain Scoresby[xiv] in 1820, saying, "no branch of zoology is so much involved as that which is entitled Cetology" (137); he quotes Beale, who says "utter confusion exists among the historians of this animal"; quotes Cuvier, John Hunter, and Lesson: "[there is an] impenetrable veil covering our knowledge of the cetacean [… it is] a field strewn with thorns; […] all these incomplete indications but serve to torture us naturalists."[xv] Melville identifies Beale and Bennet (Bennett 1840), both surgeons in the English South Sea whaleships at the time, as exacting and reliable men to remind us that the Sperm Whale, however scientific and poetic, lives incomplete in any literature. *Far and above all literature, his is an unwritten life* (146). Bringing it into writing—the codification and commodification of its body (the co-constitution is what I read as Melville's critique here), create the whale anew as an object of knowledge and control.

At the end of that chapter, one that ricochets across global and historical versions of whale classification, Ishmael cedes that whales ought to be defined as "spouting, horizontal-tailed fishes with lungs and warm blood" (140)—a characterization in which breath occupies a definitive feature. In *Sperm Whaling from New Bedford,* Elton W. Hall writes that "an experienced whaleman could identify the species of whale from the formation of the vapor and, if it were sperm, anticipate his movements from the number of times he spouted." (138) Rhythmic attunement to the temporality, intensity, and form of whale exhalation composed the early moments in the whale hunting process. Such attunement presents a kind of intimacy in the familiarity. An ocean surface punctuated by breath, back, and tail alone highlights how whales played at the limits of the otherwise terrestrial human imagination despite the scientific urges for schematic control at the time.

Indefinite Rhythms

In the introduction to this piece, I used the words 'bezoar' (from the Arabic *bazahr*/ *badzehr* meaning antidote or counter poison, a broadly popular medical remedy from the 11th century through the 18th). I also used 'gallstone' (dated 1758 from Anglo, Germanic and Norse renditions of the Greek *chol,* i.e., bile, and *lith,* i.e., stone) to reference the breadth of ambergris's

interpolation, cataloging, and becoming within modern biology. The two words are assimilated into contemporary medical science from nomenclatural genres that straddle 1. a premodern symbolic, defined by culturally-specific medical values (bezoar) and 2. A systematized natural identity by origin and morphology. Ambergris is also often referred to as a 'coprolith,' an exacting word for a genre of fossilized feces, classified as trace fossils in opposition to body fossils, as they are the material secreted and expelled— a divergent practice of natural science operating on evidence of animal behavior and diet versus morphology (see endnote ix).

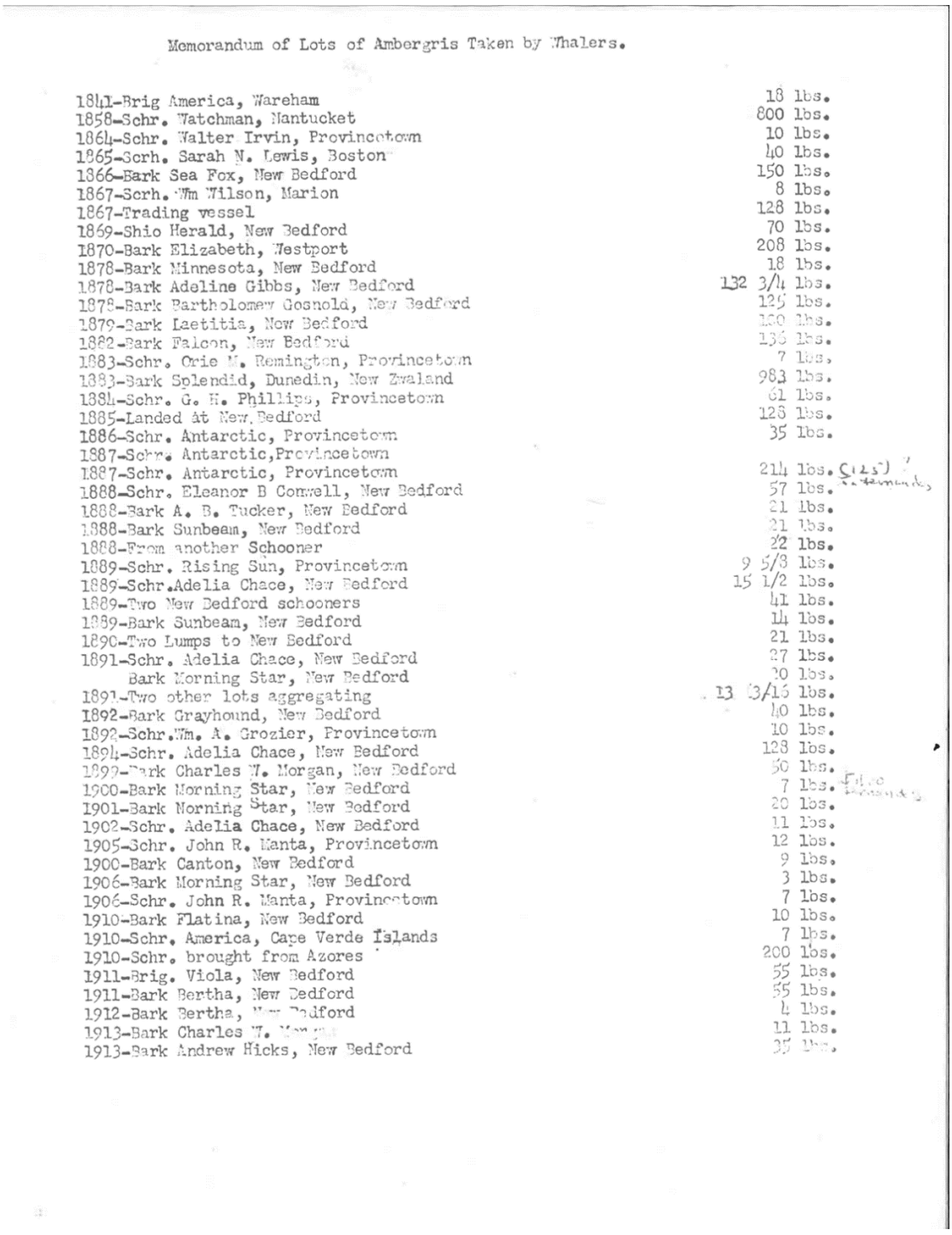
'Coprolith' was first used by William Buckland, an Oxford-ordained theologian, geologist, paleontologist whose research at the intersection of geological and biblical time in 1822 motivated him to analyze the fecal remains of a great lizard in hopes of reconstructing an ancient, biblical ecosystem. He coined the term coprolite therein: *kopros* means dung in Greek and *lithos*, stone. [xvi] Amongst many things, ambergris is a coprolith, a peri-fecal, vestigial archive of several oceanic relations congealed. These varied historical nomenclatures carry forth in the object discursively, an evolving imperial-scientific world-making practice. The dated neologism marks a shift towards the (presently stabilized) natural science organized around organs and functions, blubber, and baleen.

The classificatory breadth materialized in these words presences a move in natural scientific practice from one based on observable behavior to one grounded in dissection, a partial move from deductive to inductive reason. The space between these teases the stability of any essential nature.[xvii] The entangled labor, commercial and scientific dynamics that secure the whale's body into a registered system of authority are outlined in Burnett's book mentioned above, which provides a rich historical contextualization of ambergris' becoming differentiated at this time. I elaborate upon these dynamics as imperial modes and behaviors across the rest of the dissertation, synecdoche for the process of industrialization and the later molecularization of the sense of smell. Within this ambit, Ashley's account might read,

> We looked and listened upon the surface as one gigantic heaving lung, one that commissioned the probability of our futures. All eyes, and always at least four, scoured the sea for whales. We read the weather, waves, birds for information about ourselves in relation. Our attention made us vectors, igual ship, oar, lance—all poised for harvest. The constitutive tension of our seafaring was punctured only, and thoroughly, by the funky spray of that great breath.

What a whale was, and how, was becoming determined by its utility, framed through a set of qualities of value emerging part and parcel to the discipline of Natural History. To situate the emergence of now stably assumed marine taxonomic principles within an early American political economy, Burnett recovers a trial in New York City in 1818, Maurice v. Judd, a trial that pit new classificatory sciences organized according to evolutionary principles against the then-popular behavioral and biblically sanctioned view that the whale was a fish. The case emerged contemporaneous to active modern scientific debates spanning the scientific divide between Linnaeus (nested hierarchies based on observable similarities) and Darwin,[xviii] as the American whaling industry was coming to prominence part and parcel with a global toggling of the site of natural scientific expertise and nomenclatural authority between laborers, merchants

and academics (Linné, Carl von 1759; Darwin 1859). The immediate dispute concerned whether whale oil was fish oil and therefore subject to state inspection.



Memorandum of Lots of Ambergris Taken by Whalers.

1841-Brig America, Wareham	18 lbs.
1858-Schr. Watchman, Nantucket	800 lbs.
1864-Schr. Walter Irvin, Provincetown	10 lbs.
1865-Scrh. Sarah N. Lewis, Boston	40 lbs.
1866-Bark Sea Fox, New Bedford	150 lbs.
1867-Scrh. Wm Wilson, Marion	8 lbs.
1867-Trading vessel	128 lbs.
1869-Shio Herald, New Bedford	70 lbs.
1870-Bark Elizabeth, Westport	208 lbs.
1878-Bark Minnesota, New Bedford	18 lbs.
1878-Bark Adeline Gibbs, New Bedford	132 3/4 lbs.
1878-Bark Bartholomew Gosnold, New Bedford	125 lbs.
1879-Bark Laetitia, New Bedford	130 lbs.
1882-Bark Falcon, New Bedford	136 lbs.
1883-Schr. Orie M. Remington, Provincetown	7 lbs.
1883-Bark Splendid, Dunedin, New Zwaland	983 lbs.
1884-Schr. G. H. Phillips, Provincetown	61 lbs.
1885-Landed at New Bedford	128 lbs.
1886-Schr. Antarctic, Provincetown	35 lbs.
1887-Schr. Antarctic,Provincetown	
1887-Schr. Antarctic, Provincetown	214 lbs. (125)
1888-Schr. Eleanor B Comwell, New Bedford	57 lbs.
1888-Bark A. B. Tucker, New Bedford	21 lbs.
1888-Bark Sunbeam, New Bedford	21 lbs.
1888-From another Schooner	22 lbs.
1889-Schr. Rising Sun, Provincetown	9 5/8 lbs.
1889-Schr.Adelia Chace, New Bedford	15 1/2 lbs.
1889-Two New Bedford schooners	41 lbs.
1889-Bark Sunbeam, New Bedford	14 lbs.
1890-Two Lumps to New Bedford	21 lbs.
1891-Schr. Adelia Chace, New Bedford	27 lbs.
Bark Morning Star, New Bedford	20 lbs.
1891-Two other lots aggregating	13 3/16 lbs.
1892-Bark Grayhound, New Bedford	40 lbs.
1892-Schr.Wm. A. Grozier, Provincetown	10 lbs.
1894-Schr. Adelia Chace, New Bedford	128 lbs.
1899-Bark Charles W. Morgan, New Bedford	50 lbs.
1900-Bark Morning Star, New Bedford	7 lbs.
1901-Bark Morning Star, New Bedford	20 lbs.
1902-Schr. Adelia Chace, New Bedford	11 lbs.
1905-Schr. John R. Manta, Provincetown	12 lbs.
1900-Bark Canton, New Bedford	9 lbs.
1906-Bark Morning Star, New Bedford	3 lbs.
1906-Schr. John R. Manta, Provincetown	7 lbs.
1910-Bark Flatina, New Bedford	10 lbs.
1910-Schr. America, Cape Verde Islands	7 lbs.
1910-Schr. brought from Azores	200 lbs.
1911-Brig. Viola, New Bedford	55 lbs.
1911-Bark Bertha, New Bedford	55 lbs.
1912-Bark Bertha, New Bedford	4 lbs.
1913-Bark Charles W. Morgan	11 lbs.
1913-Bark Andrew Hicks, New Bedford	35 lbs.

Between 1841-1913 the Schooners *Watchman*, *Laetitia*, *Eleanor B. Comwell,* and Barks *Sea Fox, Elizabeth, Splendid*, and *America* each hauled over 150 lbs. of ambergris in their time at sail in the 19th century. The weight or mass of ambergris became a definitive criterion, scientific really, for cataloging and ordering it, for translating it into value from ocean to land, from whale matter to human.

Expertise concerning the scientific-cum-legal identity of the whale as fish or mammal in the early 1800s was notably suspended between: 1. whalemen who were experts in "superficial natural history," (p. 125), i.e., had expert-experiential knowledge about the surface parts of the whale: blow patter, fin shape, fluke pattern, as well as about the thick layers of fat culled as the substrate for their occupation; 2. an emerging class of American naturalists who were interested first in evolutionary function (*clade*) and modes of movement, and later organization based on class/rank informed by dissection of internal minutiae; and 3. commercial vendors interested in product qualities, who maintained that fish oil was a stinking emulsion of oil, blood, and scum as opposed to pure blubber rendered in trypots on the ship deck—relations that would be translated into the level of taxation. Relative economic clout sprang first in favor of the fisher's taxonomy, and then settled around the naturalists' new sorting methods by anatomical minutiae, themselves a product of the industrial demands of the fisheries.

By examining the economic situations that structure which scientific practices and taxonomic principles gain primacy, Burnett provides critical historical and meta context for Ashley's descriptions of hunting the wale, rendering its body, and processing it into commodity logic (Ashley's accounts, again, are those rewritten in Calibri light). In his *Systema Naturae***,** Linnaeus declares, "I hereby separate the whales from the fish," "on account of their warm bilocular heart, their lungs, their movable eyelids, their hollow ears, *penem intrantem feminam mammis lactantem* (penetration yields lactation; my translation)." Yet, well through the mid-1800s, these particular rules and ordering principles were not yet fixed as the truth of Nature. In *Moby Dick*, Melville reflects on the plasticity of natural categories, writing, "But of my own knowledge, I know that down to the year 1850, sharks and shad, alewives and herring, against Linnaeus's express edict, were still found dividing the possession of the same seas with the Leviathan." Akin to Burnett, Melville attributes the establishment of scientific certainty to commodity logic: "when, as I opine, in the course of time, the true nature of spermaceti became known, its original name was still retained by the dealers; no doubt to enhance its value by a notion so strangely significant of its scarcity." Its economic materiality became the exact substance of its "proper individuality," (Melville, 141).

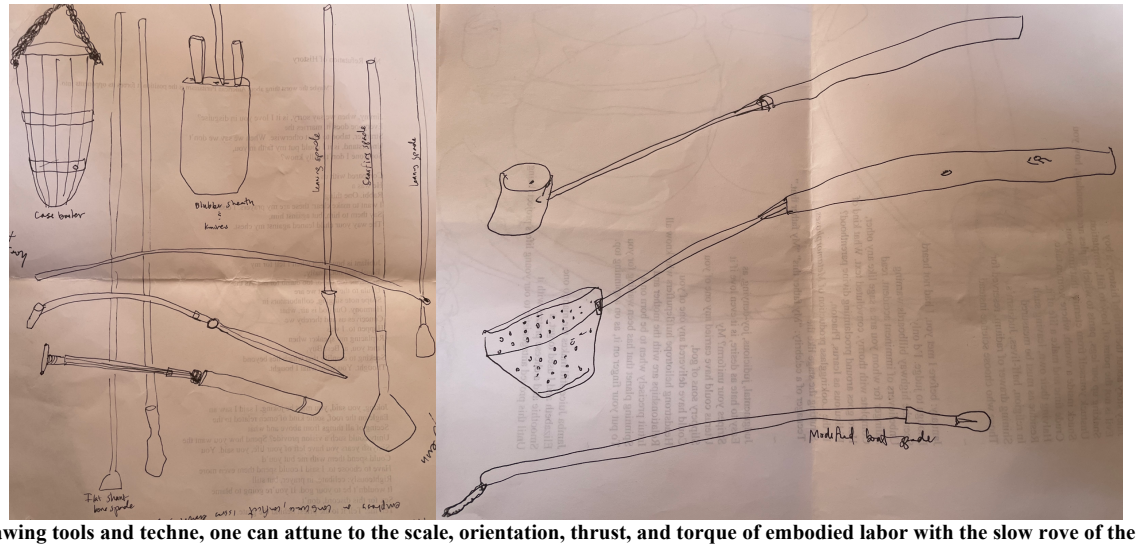
Beale's book, referenced above for the notation on whale breath, follows Buckland's 1822 classification standards shaped around organismic, internal, metabolic information. The ordering principles of his book proceed according to anatomical and physiological logic, with ambergris listed up amongst the first three items along with spermaceti (Sperm whale brain fluid)— an arrangement that seems to follow economic rank.

Beale describes ambergris as "moulded by the lower portion of the rectum of the whale" (135), an inscription that instigated a firm departure from previous, centuries-long uncertainty concerning the origins of ambergris. An account of ambergris from 1667 lists some 18 theories on its origin, ranging from an early American colonial observation that it was veined and marbled like earth and therefore must be geological; other theories link it to an amber-like secretion by coastal trees[xix] into the ocean's edge (Aftel 2014) while others toggled between birds, trees, seals, crocodiles, and bees, with the whale hypothetically swallowing the deposit. The whale had long been rumored in connection with the production of ambergris, but debates refused it as the primary source.

In establishing an industry, New England whalers created a condition for more knowledge to be created about and through ambergris, including its gestation in the gut of the whale. Theories of its intestinal formation derive from the fact of horny squid and cuttlefish beaks lodged in terrazzo formation throughout most pieces; these non-nuclear yet consistent embedded details provide a now generally accepted explanation of the mass as a pathology. Apart from the fact that ambergris has a specific gravity of about .900 and therefore floats, and that it melts at a relatively low temperature, very little was known about its chemistry until the late 1930s (for an introduction to its chemical history, see Ch. 4: *Chemical Space)*.

Today, a large number of small pieces are collected on the shores of various countries, chiefly around the Indian Ocean and the South Pacific, where a confluence of squid spawn from sub-tropical upwelling influences Sperm Whale migration, a calculus that coincides with the relative number of harvests along these coasts. Aged pieces, the grey (from which the name derives) and white masses, fetch a higher price as the aromatics within them mature from dung to sparkle. The contemporary economy pivots around pieces collected on beaches rather than in feats of oceanic tenure and bodily parsing. Dogs are trained to sniff down coasts, and mafias clandestinely rove shorelines in Stewart Island, NZ, and the SW of Ireland.

Whalers, looking for ambergris, learned to read the body of the whale according to economic value principles. If a whale looked unusually thin or if the blubber produced a small amount of oil, this could indicate the whale was sick and that they should part the intestinal canal, especially below the vent, with an ordinary cutting spade. In his book, Hall quotes an unnamed sailor as saying, “The best place to look for ambergris is inside of a dead sperm whale. In the last twenty-five years, the whaleman never casts adrift the carcass of a whale without first spading the intestines, in the often-vain hope that he will strike ambergris. Probably lots of ambergris has been lost years ago because the whaleman did not know enough to look for it, or got tired of the fruitless search.” (72) This practical knowledge was assimilated and almost routinized in material gain between 1841-1913 as some 4,328.735 lbs. of ambergris was acquired by the New England Whalers (see chart on p. 29).



By drawing tools and techne, one can attune to the scale, orientation, thrust, and torque of embodied labor with the slow rove of the eye.

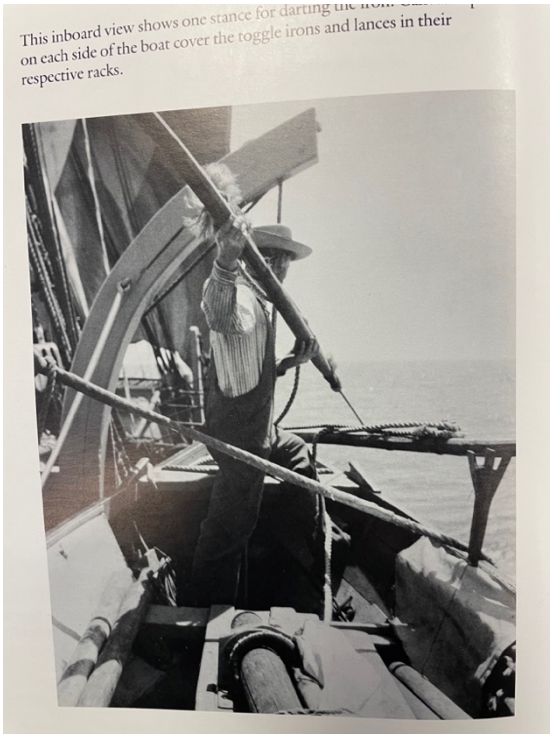
In addition to physical quantity, properties of ambergris yields are shaped by the tools of the era and the kinds of exertions they required. Ways of being then emerge part and parcel to new materials: durations and positions of listening at the surface of the ocean, the attendant subject whaler position, the assimilation of the whale into and as part of the establishment of modern science—each comes into being with the heightened valuation of the ambergris object. Following this logic, I underscore that ambergris, as it is rendered through the American whaling industry, comes into being at this time, anew. And it is in this way, as a material relation, in the mutuality of subject and object, that I mean that the senses are historical.

Hunter's Ontology

Ideas about what a whale is, and how, have a long history, and one shaped by the hunt. The hunt orients humans to each other; it gives form to specific tools and architectures. The spatial arrangements both structure and host activities and create the conditions for the whale to be transformed into parts, units, commodities out of the whole. The possibility of ambergris becomes parsed, literally given a routinized language of formation, through a very specific set of labor exertions and relations on deck, and these are the productive context for the sense.

> Six men make up a boat crew. The mate heads—the boat, and so is called the boat header. The harpooner of the boat-steerer pulls the forward oar in approaching the whale. After "getting fast" to it, he goes aft and steers the boat, giving place to the mate, who goes forward to wield the lance in the killing. The change is necessary to keep the most experienced man at each position of greatest responsibility.
>
> The whaleboat is a "double-ender" some thirty feet long, six feet in beam (width), with a very pronounced sheer to enable her to ride the roughest weather. She is sloop-rigged and fitted (single mast, jib, and mainsheet, fewer wires) with a collapsible mast sourced from olde English forests long hauled—the ongoing silvicultural need motivating new port after port.
>
> The oars bent like reeds, and I twist my neck: the boat leapt. A humid vapor escaped those pent-up lungs and engulfed us. It was all pale saline and tart fish blend then, a delicate edge of the landfill. That breath landed damp on my neck.
>
> Momentarily, I dwelled in general rankness when a powerful rush introduced a monster breach clear of the sea. Flukes torqued on high—a sublime darkness suspended against the yellow sky—there was a deafening blow as it smashed and returned below. "Give it to him,' came a cry.
>
> My boatswain lunged and buried a harpoon. Two irons followed. "Fast, by God! Peak your oars you damned lubbers!" scattered a jackal tone around us. We thrashed in equal measure, continuously. Our throats parched, and our hands in sincere occupation bled.
>
> A faint, sonorous whistle came before us.
>
> Water poured in sheets over the bow; the line whistled and tore with the economy of drums. The boat lashed through the water, boiling a wake towards the horizon. We bailed and heaved. "Stand by to haul in line!" and from our cramped positions, we grasped the inanimate rope becoming, span by span, fathom by fathom. It coiled in the stern sheets.

Gradually we hauled up against the whale, oaring ‘til we scraped the barnacled flanks, “wood to backskin.” My company drove in the lance until it brought up at the socket. A full six feet of cold steel. For an instant she churned her weapon; great fans lifted the water then tapped upon the surface. The report was like a cannon and the two other boats, two miles away, caught the swell in reverberation.



Both feet plant, the one forward prepares for a shift; a broad, sturdy grip, trained angle. The harpooner’s pose indexes a repertoire
of ability in practice—the body knows itself
and what it can do, a historicity of tasks presented.

Our quarry spouted, growing visibly weaker. Four times, hand over hand, we hauled up to lance her. Each time she carried less of our line, altering course but spouting oftener and thicker. An ever-darkening trail of crimson became our sight. Suddenly, she veered with a horrid inward convulsion, and then… a great carcass turned fin up. She lay then just awash, a seeping shadow, an undulating mass with no more semblance to a living creature than seaweed sifting by. Scavengers of deep gathered; sharp fins knifed the water about us. The day was too short for the task so hastily, we reeved a short warp through a hole we cut into her spout, passed the line from one boat to another, and in tandem, began the arduous tow miles to ship

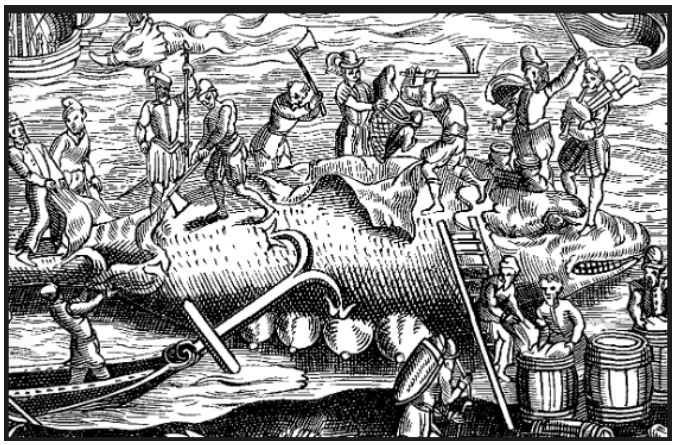
Luckily for us, *Sunbeam* crowded sail and, with a favoring wind, bore down towards us. The pull was interminable, but we heaved that carcass alongside and passed up the tow. Jangle, rattle, the fluke-chain was belted, and labored away at the windlass; that dead whale was soon fastened alongside our ship.

The ship itself is a materialization of a worldly orientation of extraction. It is the condition for the apprehension of oceanic life into human hand. The whale is seized and enacted into an economic relation. Nature is made in the skirmish, and the encounter is productive of subject positions and scientific truths about relations at once.

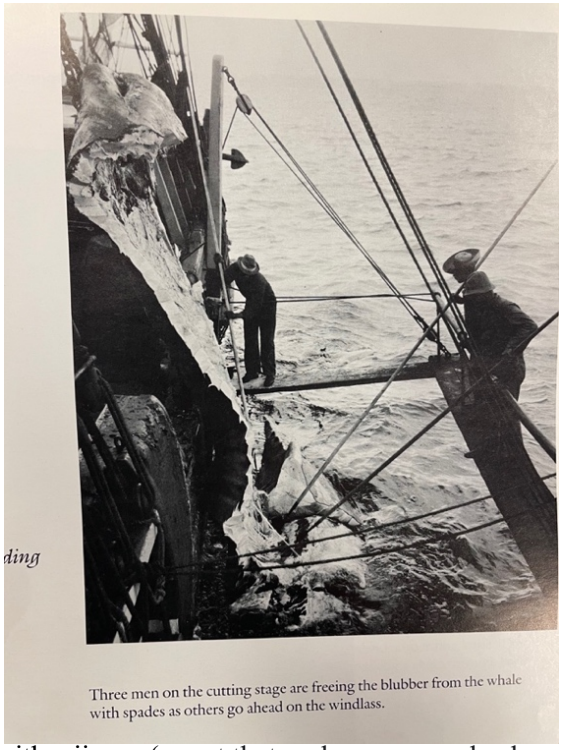
The Ship Deck Laboratory

> To grope down into the bottom of the sea after them; to have one's hand among the unspeakable foundations, ribs and very pelvis of the world; this is a fearful thing.
> -Herman Melville*, Moby Dick*

Once captured, the grueling process of *cutting-in* (flensing off blubber) a whale and *trying-out* (transforming blubber into oil in the cast iron cauldrons called tryworks) begin. Whales were hoisted up alongside the ship deck by the tail. Heads were severed first and then transferred onto the deck. Spermaceti (brain paraffin, loosely) was drained by a hole excavated into the cranium, and teeth were pried by pulley and rope. Holes cut into the whale's skull could drain up to 530 gallons of spermaceti. Slices of blubber cut as finely as possible from the 'horse' or blanket pieces were called "bible leaves" (Melville, Moby Dick, Ch. 96 "The Cassock") on New England whaling ships. Fires were lit in the base of the trywork, and leaves were lowered therein. Once boiled down, the rich oil resource filled barrels and was stacked as cargo alongside sailor berths. Ways of laboring and being emerge part and parcel with new materials.



In Hall's book, *Sperm Whaling from New Bedford,* he describes the specific forms of labor carried out on deck. The technical repertoire is shaped in architectural coordination with the design of the deck—the removal of bulwarks (an extension of a ship's sides above the level of the deck), hooking lines and fluke to take the tow, spading on the windlass (an apparatus for moving heavy weight, i.e. the anchor, on the ship), cutting on the outrigger (a projecting structure from the boat to increase equilibrium), hot-oil pouring into coopered staves—and an entire process of maneuvering long handed bailers, drawing chains, gaffs (long rods in the sail), tackles, pikes (point and edge weapon). The ship itself was a hugely determinant factor in the entire segmentation practice. Across its breadth, the processing of the blubber of a single whale took up to three days. Ashley narrates it like this:



ding

Three men on the cutting stage are freeing the blubber from the whale with spades as others go ahead on the windlass.

A whaleship always ‘cuts-in’ always over the starboard (right when facing forward) side. To facilitate this, three or four whaleboats are suspended from the lardboard (left-hand) side, while to starboard, over the gangway passage, is lashed a long platform—the cutting-stage. This is lowered from the ship’s side and boomed some ten feet over the catch. From this railed platform, shipmates toil, cutting at the blubber with long-handled, keen-edged spades, similar in durability to those used to clear ice from sidewalks.

The cutting tackle consists of a cluster of gigantic blocks fasted to the main-top [main sail], through which are rove (twisted, spinning) the two falls (suspension tackle), each suspending a heavy block and blubber-hook. This cluster of blocks is braced well forward with a jigger (a part that rocks or moves back and forth) in order that the two hooks may sing directly over the blubber-room at the main hatch. The blubber, except the film-like coating called ‘backskin’ easily scraped off with a thumbnail, is the only outer covering of the whale. It separates readily from the flesh beneath so that generally, only vertical incisions were made with the spades along a line termed the “scarf” and the lift of the windlass ripped the blubber from the carcass *much as the peel is skinned from an orange*, requiring only an occasional jab from the spade to keep it free. The whale rolls over and over in the water as it is unwound. The mates on the stage hack with their spaces a corkscrew line about the rolling body, and the heave of the windlass tears away the blubber.

When the end of the strip has been hauled, a third mate at his station in the [waist] with a long boarding-knife punctures two holes through it through which a chain strap is wound and a tackle hooked to it. The first blanket piece is swung aboard.

To get that hook in place, however, it was necessary to send a man down. Removed of coat and suspended in a ‘monkey rope’; about his waist, the man is dropped sprawling onto the slippery, heaving flank of the whale—hovering precariously above innumerable sharks, which tear incessantly at the unstable flesh while the sea breaks over them all.

M stood by the gangway with their boarding-knife and swung the pieces inboard. Cooper perspired over the squeaking grindstone grunting, *sharp spade,* which kept him ‘humping.’ Between decks, in the blubber room, one stowed down the ‘blankets’ and cut them into smaller ‘horse pieces.’ Above, the other watch steadied huge chunks, and lugged the heavy block and chain back to the gangway, sliding and slipping in the gurry (offal).

The spiral cutting progressed to a point midway between the hump and flukes. Afterwards, the body was slashed open vertically, the guts spilling forth with the weight

of 1000 fish. Knees braced upon a suspended plank; men sank arms shoulder deep and unadvisedly further with blind and yanking deliberation; in vain they searched for ambergris within the ghastly hollow.

At this point, two vertebrae were disjointed and the carcass cast adrift. We hauled the remnant part from the sea, severed the flukes, and freed the chain; we cast the denuded carcass down to the sharks. From here on out, we hoisted the junk—the lower half of the forehead and fastened it to the lash rail aft of the gangway. The real lift of the day came with the case--- twenty tons or more brought the starboard close to water level and the ship groaned under the strain. Half on deck, half on board, it was secured and the stage hoisted out of the way.

All hands were called to brace the whale. We were five-and-forty barrels nearer to “full ship” at this point. So, we began “bailing the case.” After ‘splicing the mainbrace’ (securing the main mast’s rope), some of the portion of the litter had been cleared away and the cutting falls sent down. We prepared the try-works—cutting horse-pieces and bailing the case (harvesting dome oil). The waist (mid-ship) was lighted with a few thick-globed lanterns, which diffused a feeble radiance over the scene. Forward a cresset of burning scrap flared above the try-works.

The tail of the beaver, the hump of the camel, and the case of sperm whale each have the same function—the hoarding-up of reserve nourishment against a time of fast. Fatty and unctuous, glistening and pearly, the cavernous reservoir lay open before us like some vast comb of honey, trickling its stored-up treasure over the sullied planking. Stark naked, three black men climbed into its tank, wallowing to their waists with knives and scoops with which they half cut, half ladled the barrels of pulpy drip from the cells. With tubs, buckets, and pails, an improvised bucket brigade passed the prized contents forward to the try-pots, where two bronze figures, standing in a capacious kettle, tore the oozing pulp to shreds amidst their groping fingers.

Delving deeper with an eagerness requiring no encouragement, the bailers labored without cessation. The try-pots were filled, but still, the supply held, 'til thirty barrels of pure spermaceti stood brimming in tubs along the bulwarks. The scuppers were then stoppered, and the deck lay awash with gurry and congealing case matter. Through this, the men splashed and slipped and, with “save-all,” and shovel scooped the precious leakage and poured it into the tubs.

Under the try-pots, fires were started, and the flames leaped hungrily high above the funnels, throwing a lurid glare over the shifted scene. Above, the wan-ghostly sails flapped and glowed; the flames contorted wildly in the back draught caused by the flapping. Black toiling figures teemed like ants about the decks, and all made a picture the weirdness of which suggested a transcript from the nether world. Like a presiding evil spirit, my boatsmyn’s face shone dark in the intense heat before the whorls as he forked the minced “books” of blubber and soused them in the seething cauldrons.

The work went on all night. Horse-pieces were minced, and the tried-out scrap was fed to the fire. Black smoke belched from the stacks, darkening with thick soot the rigging aloft and nearby the bow boat. The tried-out oil was bailed to the deck cooler. More blubber was fed. Men passing by, helped themselves to choice bits of well-fried scrap. A pungent, sickening odor burdened our breath.

Our pots could try-out about two barrels of oil an hour, our new ontology of time. At this rate, we now had perhaps fifty barrels of almost boiling oil in the large metal coolers between decks. Driven aft by that night's heat, the cockroaches swarmed the cabin. During the meager hours of rest, we startled awake by their hollow legs running across our faces.

Almost under the trypots, the forecastle was a veritable hell: the floor was buried in a heap of musty and mildewed garments, each soaked and oiled from constant duty overboard and contact with the seeping blubber. Exposed on the decks, the blubber began to rot within twenty-four hours after being stowed down, toggling our sensorial suffering between the opacity of burning fleshes and the nausea of decay.
The second night was hotter.

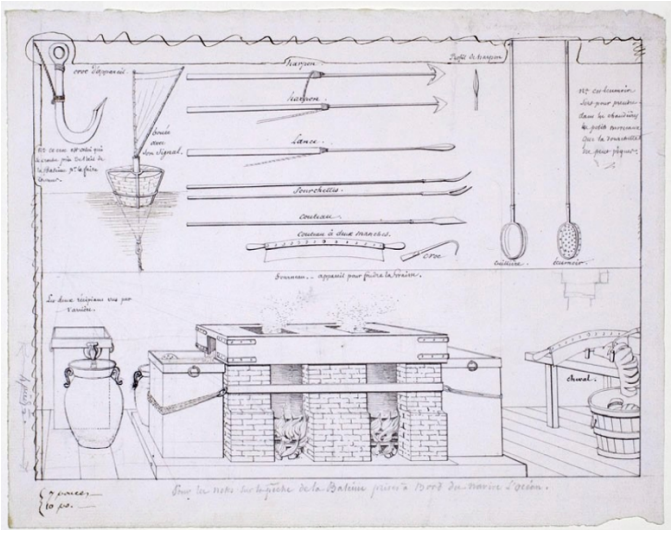
Spouting was continuous in the following days. Shortly, we raised another solitary bull. I end my account with the repeated sharp suck of lance, the echo of "Vast Pulling!" "Stern All!" and the image of a lifeless god mass bobbing quietly windward.
We had a very good whaling, so good we had to pump several hundred barrels of fresh water overboard to make room for the oil. Twenty-three months after she sailed from New Bedford, she made port again, a full ship.

The American fishery perfected the spiral method of cutting in, aided by the heave of the windlass, roiling the whale in the water and excising blubber in continuous strips. Whale bodies were dissected and dissociated with increased speed/efficiency.

Ashley's account enumerates the painstaking labor, technical skill, and forms of dexterity entrained to remake the whale as a set of sellable units. The truth of parts was debated and conferred in categories in response to the effect of the tools in bodily striation. Categories emerged and were confirmed in variable viscosities or durability. These material natures were conferred in their application, their processing on ship, and again in their use on land.

In the New England Whaling Industry, every part of the whale was turned into value, and each part carried possibilities for new sensorial modes. Spermaceti was processed into a clear wax substrate yielding soft light candles for new colonial homes. Spermaceti wax candles were the very first commodity of the New England settlements. The wax was priced at around $3/gallon at the turn of the century— a high price at the time for virgin material. Scrimshaw, ornately carved jaw, and other marine mammal bones were engraved by sail needles during the hours and years adrift. In mediating their idleness, maybe boredom, at sea whalers' hand-crafted tactile archives encoded those hours and their visions, the surprises at sea.[xx] The solid impaction occasionally found in the bile duct of the cachalot, that which is called ambergris, achieved an elevated commercial quality as a perfume fixative for an industry that was able to rise once sustained accumulation channels were established. The whaling industry supplied a new scale of matter to burgeoning perfumers.

The techniques of breaking down the whale body produced discrete object units: blubber, spermaceti, and ambergris. In the act of slaughter on deck, new economic resources were generated out of the body of a whale; a new taxonomy came into being as the whale was parsed as part of a larger industrial logic of making and remaking the world. These labors of biological rendering thus were not only generative of the classification systems being debated on land, they also conferred an economic cosmology, subsuming an entire set of relations: current, migration, seasonal spawn, specie interaction, and digestion, into a market teleological thrust. As Barad says, "We are part of the world in its differential becoming." (829)

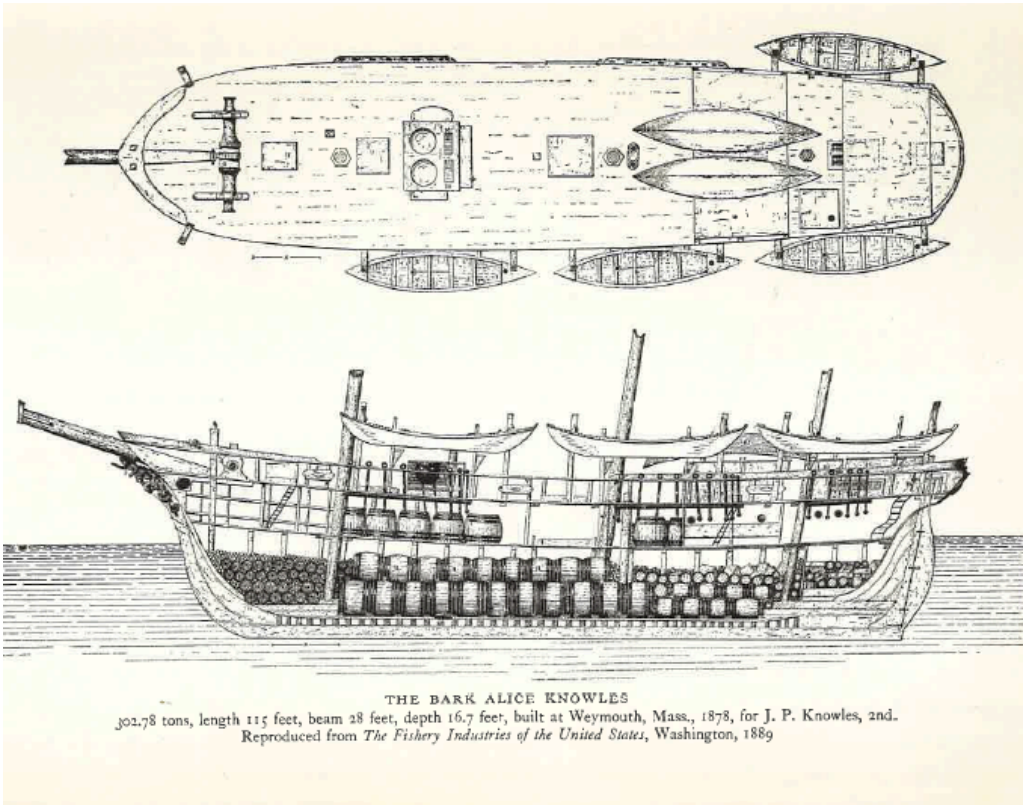


The trywork enabled the large-scale dis-integration and rendering anew of the body of sperm whales into commodities; it made ambergris acquisition more systematic, creating a commodity surplus condition for a middle class-sensory practice.

A *trywork*, a cast-iron and brick furnace located just in front of the main mast, is perhaps the most distinguishing feature of the whaling ship and its processing capacity at this time. Braced to the deck by iron, stacked on bricks, iron cauldrons doubled atop, the trywork enabled the onsite recovery of oil from blubber. Processing the entirety of a Sperm whale could take weeks, and the breakdown of its body was coordinated in iterative response to the shape, duration, and treatment capacities of technical equipment on board.

The trywork was a key apparatus determining what a whale is, how it is, and what it is for according to the logic of capital. The built-in ability to render fats on-site rather than back at port stretched the effective interval whaling crews could stay at sea by months, as well as the distances they could travel for the hunt.[xxi] The addition of the tryworks enabled whalers to boil and hunt in an integrated process and store the rendered fats in barrels on ship for months and years-- all ready for market dissemination. The trywork commanded the central space on the ship's deck (see picture below), enabling a new processing speed and capacity for storing oceanic commodities.

It is a common argument by historians of whaling that the tryworks provided a pivotal technology for intensifying the metabolism of the whale body and thereby expanding the reach of the industry: "The use of the onboard trywork as the major technological innovation that enabled the success of the Yankee whaling industry." (Ashley 1907, 26-7. See also Davis, Gallman, and Gleiter 2007, and Credland 1982). As such, it was critical to the rationalization of whale parts as measurable, sellable units.



THE BARK ALICE KNOWLES
302.78 tons, length 115 feet, beam 28 feet, depth 16.7 feet, built at Weymouth, Mass., 1878, for J. P. Knowles, 2nd.
Reproduced from *The Fishery Industries of the United States*, Washington, 1889

The trywork enabled a new condition for accumulation at sea, integrating the productivity of factory-scale work and laboratory articulation on one floating site.

In many ways, then, the trywork advanced the New England whaling industry and contributed to the consolidation of early American labor power on the Atlantic between 1825-1920—as well as the rising economic stability of the New England colonies and the establishment of a competitive natural scientific expertise on the North American continent. These together create the broad

context in which new materials, and more of them, begin to flow between the Americas and the steadily globalizing bourgeois European sense-scape.

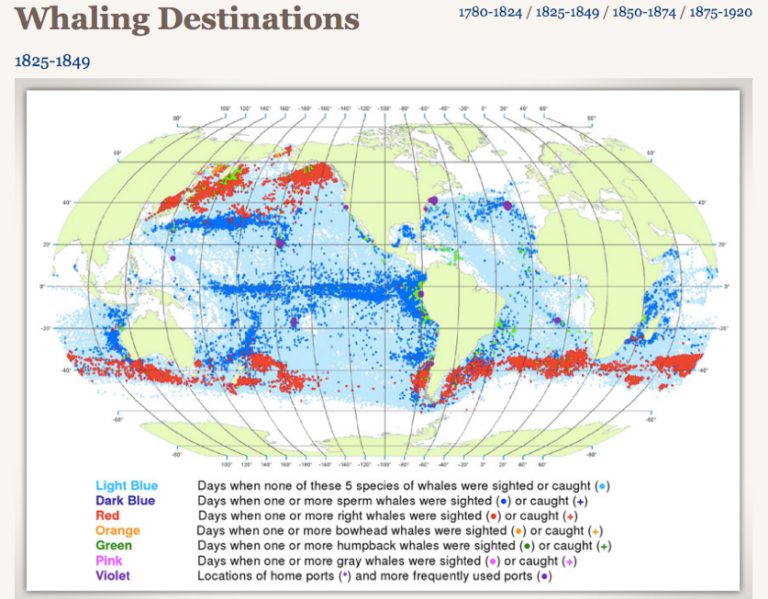
Conditioning Pelagic Factories

In "Geometry in the Colossal: The Project of Metaphysical Globalization," Peter Sloterdijk locates the fundaments of modernity and modern thought in maritime expansion (Sloterdijk and Butler 2009). While his analysis focuses on European expansion between the 15-17th centuries, he argues that "the fundamental fact of modernity is not that the earth orbits the sun, but rather that money circumnavigates the earth. The theory of the sphere is, at the same time, the first analysis of power." (33) While I am less interested in the idea of a modernist break or a singular thrust for such a thing anyway, the conceptual unity of the sphere and the process of unifying the globe through new forms and scales of oceanic trade put fire, as it were in this case, to the then-emerging practice of a geometric-cum-economic absolute.

This conceptual global unity coheres to a form of monotheism with objective science, confirming the possibility of deriving the essence of things in sciences like math, biology, physics, and later chemistry. The practical aspects of oceanic imperialism—the transnational logistics and scalar rendering techniques—quite literally make the earth a globe, connecting places through, as Sloterdijk says, money, and also commodity by analogue. Setting to sea for material acquisition: the turning of the sea into object & resource on the ship deck, the scientific establishment of fact, fixing the fact of the nature of things, and conferring their value as such are constitutive of one another as part of this worlding.

The mid-1800s mark a dramatic point of amplification in whaling vessel tonnage and quantity. In these years, New Bedford replaced Nantucket as the world's largest whaling port. In 1851, the same year that Melville published *Moby-Dick*, 137 whalers departed from New Bedford, half of them bound for the Pacific (Davis, Gallman, and Gleiter, 70). Although it was headquartered in New England, the American whale fishery had become a global enterprise. It was foundational to the young American political economy—and to States' participation within an increasingly commodity-circulating world.

In *The Sounding of the Whale*, a subsequent book, D. Graham Burnett details the long durée movement of a global whaling practiced as "a slaughterhouse anatomy under macabre and trying conditions" to one exercised as a "tidy militarist science,"[xxii] --- the principles and practices of which I argue encode/are encoded in the contemporary fragrance industry in later chapters (Burnett 2013). He traces the limits to the practice of nineteenth-century naturalists whose fledgling ambitions were eligible for exploration upon a few unwieldy bones or the occasional stranded calf or carcass. He articulates how a statistical approach to the biological organism, a more 'modern' science, only became possible, indeed was only necessary, once the factory whaling regime was in full swing, when 'population control' became the necessary question.[xxiii]



Slowly, and then more quickly, oceans, whales, and their many oozing or congealed parts together became assimilated into categories of capital. The contours and edges of oceanic maps—later fossil fuel and also molecular, correspond with and partially constitute a proposal for imperial control that is also a power to produce sensory life.

The factory setting Burnett explores shares many similarities with the southern whaling industry but with more extensive spatializations, articulations for more labor, and machinery for processing more mass.[xxiv] Further, Burnett's likening of ocean space to quarries powers the argument that labor and the raw materials from 19th-century whaling set the condition for what he calls the 'pelagic factories' of the 1920s. This argument supports aspects of my research concerning the imbrication of science and industry and the ways in which the productivity of the factory endures, even as the material specificities of an industry evolve.

A Sense for Ambergris

> Who would think, then, that such fine ladies and gentlemen should regale themselves with an essence found in the inglorious bowels of a sick whale! Yet it is so…I have forgotten to say that there were found in this ambergris, certain hard, round, bony plates, which at first Stubb thought might be sailors' trousers buttons; but it afterwards turned out that they were nothing more than pieces of small squid bones embalmed in that manner.
>
> Now that the incorruption of this most fragrant ambergris should be found in the heart of such decay; is this nothing? Bethink thee of that saying of St. Paul in Corinthians, about corruptions and incorruption; how that we are sown in dishonor, but raised in glory.
> -Herman Melville*, Moby-Dick: or, the Whale*

As a geographer, I interpret *Moby Dick* as a political economic exegesis of a regime change in the taxonomy of the whale, one where the ontological status of whales comes to be defined by the nascent industrial urban demand. In Chapter 92: Ambergris**,** highlighted above, as in other chapters therein, Melville defines the very body of the whale by the human activity and labor within and upon it[xxv] —activities explicitly derived in response to the imperatives of surplus resource extraction.

In this epigraph, Melville unfurls the saturated nature of the ambergris commodity: he connects its sensorial qualities and the pleasures of class to the imperial conditions of possibility for its activation as such. His description of its physical qualities blends seamlessly into both the luxury products and social relations it partially constitutes; its olfactory characteristics blend into its metaphysical stature in religious ritual.

These effusive attributes flow from class critique and back into the whale's bowels in the same turn, equating the natural, biological, and material-industrial. In linking the sailor's trouser buttons to ambergris's cuttlefish beak consistency, Melville reveals the human conjoinment of the inviolable guttural and oceanic depths of the whale to daily labor practice, costume, physical activity, and class status. The selection terminates with ambiguity as Melville questions the relationship between decay and glory. Is the corruption he names death or industrialization, and what does their correspondence open up through the metaphysical, sensory splendor yielded in the interim? And is this elusive dual valence of de- and re-generation exactly the quality of materiality that enchants us so by ambergris?

It is not my intention to resolve this ambiguity since the historical conditions (colonialism, imperialism, capitalism) of the sensorium stimulated by ambergris as it becomes linked with class status and luxury, daily intimate ritual and hygiene, projections of gender as well as personal fantasy, foreclose, I think, any possibility or necessity of resolution.[xxvi] While Melville's mention of St. Paul and Corinthians introduces questions of temptation, seduction, and righteousness in religion, my read situates the stated ambiguity in the relations between commodity form and process.

Across this chapter, I have explored the material conditions and technical relations that rendered the Sperm whale body viable as a resource for industrial development. I inquired into the distinctive choreographies that separate this great cetacean from the ocean and yield its body mass forth for economic fragmentation to understand how, practically, ambergris becomes an object in commodified circulation. By reading primary accounts, photographs, ship deck graphics, sailor's logbooks, literary compositions, and secondary analyses, and by visiting archives and museums, I have explored how the whale as we know it is a product of its appropriation as an economic object. Likewise, I explored how historical acts of human labor articulated the formation of its biological body and the predominant archive of its observed behaviors. In much of taxonomic practice, life forms correlate to economic lexicons and forms of consciousness, the genesis of which (both together) is a spatial, geographical process. Thus, even though the conglomerate mass of squid beak and digestive secretion pre-exist its finding in the height of the New Bedford whaling industry, the activities introduced upon the body of the whale in the 1800s conduct that particular object forth as a host and catalyst for many new possibilities.

The human nose, too, physically precedes its activation in any olfactory encounter. This chapter sets a historical stage for showing how the sense of smell, and the senses at large for that matter, occur not merely upon a transcendent biological body, but as a set of worldly relations. The senses occur contiguously, in continuity with objects. Ambergris is one object that teaches us about the nature of smell, about the ways smell is tied to its geography and not merely a physiological event. It shows us the objects in transition from ecology to economy, and the ways in which its milieu is reoriented into a commodity life that is also a socialized sense. In the

moment of mass separation of ambergris from its biogeography, I have parsed a piece of it, its oceanic, imperial imaginary, and eco-genetic formation.

The development of the modern sense of smell depends partly on the filling in of oceanic, geographic spaces: ones sounded, charted, and harpooned to yield more. The articulation of the modern perfume industry is propped up on the kinds of vested travel, acquisition, slaughter, and exploitation that characterize the whaling industry in subtle and direct ways. These, of course, evoke many affects, which assemble and carry forward in synthetic fragrance and interrelated petrochemical orientations/landscapes.

When I say that the whaling industry produced the whale, the object ambergris, and the senses anew, I do not state this as a determinative process full stop. As I gestured, my mostly genealogical approach to this study embraces both continuity and discontinuity in history, aligning with Foucault's notion of the *episteme* (2007) that emphasizes not only the historical and contingent conditions of the universal and absolute but also how they play out over epochal timescales with residual natures. In the following chapters, then, I trace out shifts in the material conditions and relations of the perfume industry as it develops into a spatialized, monarchical practice of luxury and class-distanced (hygienic) safety in France; I then follow it into the development of a bourgeois condition that founds its reproduction through the chemical fragrance industry.

Chapter 2

Object Affects:
Social Space

Dense Objects
Public Bodies
Olfactory Captivation
Territories of Feeling

Dense Objects

> Memory cannot be confined to a purely mentalist or subjective sphere. It is a culturally mediated material practice that is activated by embodied acts and semantically dense objects.
> -Nadia Seremetakis, *The Senses Still*

The value of ambergris preexists its commodity formation on the whaleship. All objects are assembled in a certain way, as much through the labors of their rendering as through practices of use. In both cases, they are inseparable from the political contexts in which they are embedded. An object is the sum of the processes of its rendering, its orientations in use, its shared meaning, and the set of values that it embeds; the social is 'in' the material. Objects constitute social relations, and as relations change, so do objects. Ambergris is an object with a long history.

The arbitration of the meaning and value of ambergris in France for olfactory purposes has a deep legacy long before the formalization of perfumery as an industry. Between the fourteenth and nineteenth centuries, tiny metal apple charm chambers of olfactory matter swung from the waistcoats, belts, necks, and finger rings of upper-class Western Europeans, displaying class power visually and olfactorily. A manner of breathing and conditioning the atmosphere with curated aroma, these perforated openwork charms, derived their name, *pomanders*, from ambergris. The French *pomme d'Ambre,* "apple of ambergris," held pungent compressions of the eponymous substance alongside other selected scent pastes and powders in adjacent hinged chambers. Musk, myrrh, violet, mint, lemon balm, and mixtures of sandalwood, camphor, storax, and rose were considered antidotes to pestilence and unclean air, concepts that spatialized disease.

The idea of miasma, atmospheric contagion, had influenced European practical and affective relations to space from at least Hippocrates (4 BCE) to the advents of Pasteurian chemistry in the 1880s. Miasma theory postulated that disease resulted from environmental emanations that roved through space as infectious mists or noxious vapors following delicate shifts in the spatial economy. During plagues in the Middle Ages and cholera epidemics in the 19th century, it was common practice for doctors to advise disinfection of home space with intense, selected aromas to counteract the presence of disease. Against the infiltration of an offensive atmosphere, people fumigated their homes, carried pomanders for a protective personal circumference (or carried handkerchiefs or sponges soaked in vinegar for the affordable majority), and distanced themselves from areas of stench and disease as best they could. The notion of miasma also made way for a whole set of spatial and state interventions, and charged an entire scent regime with binary ideas of good/bad, healthy/sick, which, unsurprisingly, were linked to class status.

Ideas about the environment and the status of bodies circulated specifically in and as the sense of smell at this time—good and evil, high and low. The miasma episteme dies hard (one need look no farther than 2020); it is memorialized in modern praxes of hygiene as new interpretations emerge. Interactions with smell today are thus redolent with a deep set of social imaginaries concerning class status materialized in spatial ritual. The formation of the modern sense of smell as conditioned by miasma and its relation to spatialized class consciousness grows from the colonial-financial conditions of pre-revolutionary France.

Prior to its industrial increase in circulation availed by the whaling industry, ambergris already carried sensorial value in European households during the 16th-18th centuries. Where the matter pre-existed its commodity form in perfumery, its socially distinguishing attributes were long activated as spatial, olfactory constitutions of status and hierarchy.[xxvii] The pomanders above were worn by the upper class in the 17th and 18th centuries to atmospherically extend the circumference of a body in hopes of holding diseased air in abeyance.

In this chapter, I inquire into the legacy of modern olfaction as it constitutes ideas about the composition of the atmosphere, the status of bodies moving within it, and the early formation of spatial governance for hygiene that partially articulates a bourgeois condition. I follow ambergris as it wafts from the flamboyant landscapes of the French court around the 18th century through to its domestic commodification in the households of the petit bourgeoisie in the 19th—following the increase in its circulation availed by the whaling industry. I trace various mechanisms by which the sense of smell charges political life in spatial and socially differentiating ways. I do not posit a singular origin or model of thrust; instead, I track a flexible entanglement of Euro-industrial ideas about atmosphere, health, class, and the body.

In the last chapter, I explored the history of the creation of ambergris as a commodity object. In the following pages, I contextualize the shifting valuation of ambergris from a rare, bio-

geographic commodity into a national sensory-hygienic regime. I linger on the remains of the oceanic milieux in its cosmetic transformation, engaging ambergris as an artifact bearing 'sensory multiplicities' (Seremetakis 1994, 24), thereby anchoring a vast social unconscious of sensory-emotive experiences. Such objects function as a "meta-sense" (9) for the ways in which they resonate with the material conditions of their making as well as through the specificity of media. The exists as objects of production and consumption, differentially, at once. I attend to such multiplicity in the formations of ambergris explored in this chapter, and listen for their echoes across this study as relations and materials evolve.

Public Bodies

> I have often suspected, that there may be in the Air some yet more latent Qualities or Powers differing enough from all these **[]**, and principally due to the Substantial Parts or Ingredients, whereof it consists. For this is not as many imagine a simple and elementary body, but a confused aggregate of 'effluviums' from such differing bodies, that, though they all agree in constituting by their minuteness and various motions one great mass of fluid matter, yet perhaps there is scarce a more heterogeneous body in the world.
> -Robert Boyle, *Suspicions about the Hidden Realities of the Air*

> The so-called revolutions of 1848 were but poor incidents – small fractures and fissures in the dry crust of European society. However, they denounced the abyss. Beneath the apparently solid surface, they betrayed oceans of liquid matter, only needing expansion to rend into fragments continents of hard rock. Noisily and confusedly, they proclaimed the emancipation of the Proletarian, i.e., the secret of the 19th century, and of the revolution of that century …. But, although the atmosphere in which we live, weighs upon every one with a 20,000 lb. force, do you feel it? No more than European society before 1848 felt the revolutionary atmosphere enveloping and pressing it from all sides.
> -Marx*, People's Paper*

By the time of the Enlightenment in Europe, centuries of suffering and death due to plague conditioned fear and uncertainty concerning the composition of air, water, the atmosphere, and the animation of the natural environment. Land enclosure had begun to reconfigure patterns of access to fertile land work and tenure; in newly condensing urban zones, air had become differential in quality and access and was, as Boyle stated, heterogeneous. Water-logged and dank, swamps stood as zones of political inflection and critical sites for deliberating Enlightenment ideals.[xxviii] Robert Boyle, son of a deputy escheator who made himself the first earl of Cork through such institutionalized appropriation (escheation), became a leading voice contesting the constitution of air.[xxix]

With life under miasma, stench was equivalent to disease, which created a spatial logic of proximity and distance. From atmospheric subtleties, judgments of risk were drawn: a cracked window or condensation on a wall could portend the shrill of plague upon a household. (Corbin 1986) The theory gained traction in popular consciousness in growing commercial centers—documented well for Paris and London—where disease became linked to industrial aggregations of human life and the related spatial asymmetries concerning labor and accumulation (Mitchell 2014). [xxx] Zones occupied by tanneries, for example, manufactured both aromatic and stench-related class positions part and parcel with stagnant waters and other industry-specific refuse. Scent qualified the constitution of air, and evolving patterns of urban sewage and industrial waste yielded new variants of fear as well as methods for trying to prevent infectious diseases.

The social productivity of miasma theory in 18th century France provides a compelling genetic trajectory for thinking about the extant social value fueling the rise of perfume as an industry in the following epoch. The emergent precepts of public hygiene shaped normative life by reforming the social meaning and practice of scent.

The presence of miasma through scent was believed to be countered through the airing of other selected, prescribed aromas. Doctors in the sixteenth century used cinnamon, rose, civet, orange, and musk to decontaminate everyday objects—linen, fabric, and letters. Gunpowder, arsenic, lime, turpentine, ammonia, and animal excrement were likewise used to disinfect the homes of deceased victims. The names resonate forward, and one can almost imagine that first Earl of Cork, father of Boyle, exacting his bounty amongst such finite residual wafting. Doctors touched sick patients with scented gloves, washed their faces and hands with scented lotions, dabbed their temples, lips, and nostrils with perfumed balms, and put scented pastilles in their mouths.

The word *Parfumers* entered the French language in 1528 in reference to plague-time doctors who were allowed and entreated to enter contaminated residences during epidemics. This virtual costume, designed by a court physician during the 1619 epidemic, was never worn, though the mask reference maintains central visibility in Venice's annual carnaval to this day). The mask was made of black Moroccan leather; goggles and a hat were added later. The beak was designed to fill with aromatic substances to filter and condition otherwise the physician's breathing space.

The perfumer-fumigator was an ally to doctors during seventeenth-century epidemics, and household fumigation was entrusted to perfumers who would seal doors and windows, moving from room to room with a hot pan upon which they melted aromatic substances to yield thick fragrant smoke. The doctor, as pictured here, was a spatial mediator. The use of smoke connects him to religious practice—and transhistorical legacy of smoke signaling that born by word 'perfume, which derives from the Latin *par fumum*, in smoke.(Corbin 1986, 62-66).

In *The Foul and the Fragrant: Odor and the French Social Imagination* [xxxi], Alain Corbin itemizes how ideas of hygiene and state participation were organized early on around relieving, and later preventing, olfactory (i.e., spatial, atmospheric) risk in volatile political climates. Between 1770 and 1780 urban French scientists, called noses, attempted the classification of urban space through the collection, decantation, and preservation of 'airs' and gases. They also attempted to evaluate the effects of each through experimental exposure on the animal organism.

The Société Royale de Médecins, the first state agency enacting a field of health and hygiene, developed an early lexicon of safely respirable airs and dangerous stink emanations.[xxxii] They attempted to parse an olfactory language, 'life exhalations,' in relation to climate and geography as conditioning features of epidemics. The Royal Society established a network of provincial and foreign physicians to conduct early chemical, meteorological and anatomical research on men

and animals; the miasma inquiry consolidated around bodies of water, including marshes and stagnant ponds as causative disease agents. (Hannaway, 1972) [xxxiii]

The state organized scientist sniffers, including Antoine-Laurent Lavoisier, the designated father of modern chemistry (see Chapter 5 for more), to gather empirical information about the risk of disease in the city's environment, which offered support for spatial interventions. The spaces of prisons, hospitals, barracks, ships, slaughterhouses, theaters, and concert halls drew the attention of Lavoisier and hygienists who sought to contain and neutralize infection in their spatial constraints. Courtyards were paved, windows installed, overcrowding regimented, and sewer pipes structured anew (Lavoisier 1955, 492-3) Eudiometry, a technical language attempting to translate the practices of spatial olfactory vigilance into a shared and trackable lexicon via eudiometer, an atmospheric thermometer of sorts, developed in parallel to "the leap forward" in chemistry (1760-69; Corbin 1986, 14-16).[xxxiv] Eudiometric classifications were ambiguous, [xxxv] but the olfactory practices of discernment persist in urban waste and water management today.

Foucault noted how nuanced tactics of prevention and dispersion introduced in Paris in response to smallpox in 1762/3 and Cholera in 1832 generated a central frame for intervention in urban space and countryside (Foucault 2009, 64).[xxxvi] Security was articulated in terms of hygiene through some of the individuations of spatial forms mentioned above, as well as through hospital beds, tombs, and the development of the private WC, at first for aristocrats. A muddled etiology of causes: local unhygienic conditions, the constituents of the air, physical and moral degradation—informed too by French colonial power imaginaries in Egypt, Syria, and Turkey (Le Guérer 1992, 55)-- elaborated and consolidated the power of the state by justifying these interventions. [xxxvii]

The social-atmospheric specter of 'urban suffocation' (Corbin 1986, 57) articulated notions of 'pure' air in relation to locational density, social composition, and moral virtue, all of which legitimated the expansion of state scientific practice. Modern governable (state) space, language, and ideas about the individual citizen were made together. Marx's invocation of *atmosphere* in the revolutionary pamphlet quoted at the top of the section, though later, evokes a turbulent material imagination intertwining the element of air alongside public relation to the state. The portentous citation of the *atmospheric* continues to upend the mostly solid metaphorical foundation for much social philosophy. Marx's introduction of the atmosphere names the multiplicity of phase change in material politics, presencing how qualities of breath politicize the air and condition life. [xxxviii] The emergent precepts of public hygiene in relation to differential condensed airs bore upon the social meaning and practice of scent in shaping normative life.

Olfactory Captivation

> What can one demand of my art today? To prove my patriotism, should I create a perfume based upon the odour of blood that permeates the air around the guillotine?
> -Jean-Louis Fargeon, perfumer to Marie Antoinette

Again, in 17th and 18th century France, scent played an important role in the spatial organization of society—classifications of who smelled how and which spaces they occupied were built upon two adjacent historical pulses: an early modern European post-plague articulation of personal

hygiene, and a productive popular imaginary of regal splendor celebrated with particular olfactory extravagance through the Louis (1643-1793)— with iconographic apex by Maria Antoinette.

Jean-Louis Fargeon, arguably the first celebrity perfumer, is quoted above in reference to the historic, symbolic-affective production the perfumer has performed since his time. Perfumers employ geographic consciousness as their foundational resource, particularly via the culinary and olfactive plunders of parallel colonial trajectories. They enact these for centralized subjects of symbolic power (reagents etc.). In the quote, Fargeon emphasizes 1. the rise of an affective public consciousness linked to smell that names, part and parcel to it, the exact political conditions of a moment, and 2. the ways in which historical moments, places, peoples, and events become the material-affective lexicon aspirated in perfume. To develop my perspective on the activation of material-symbolic reference in perfumery, I take us into a short aromatic history of pre-industrial and circum-revolutionary France.

The popular imagination concerning the French courts and aristocracy of Lous XIV-XVI is among the ripest historical reserves for conceptualizing the territory of olfactive meaning.[xxxix] The French court had, by the Revolution, largely shaped regional European tastes for perfume for several centuries (Stamelman 2006, 63). 19th French sensualist philosophy stipulated that sensation was the most important form of cognition, and the perfume industry developed not only from medical /prophylactic scent practice but also from early aristocratic uses of scent to signal an enlightened palette of privilege. Louis XIV (1643-1715) was famed for scent application not only to his body and its broad circumferential wafting, but also to a breadth of garments, fans, and furniture; this curated aromatic palette would have preceded and followed him through the palace and grounds, marking territory and impressing his presence in space and breath.

He favored the robust and heady animal odors of ambergris and musk amongst a capacious bouquet yielded from France's vast colonial exploits, some of which materialized in/as the gardens of Versailles. The grounds of Versailles, famously terraformed first by XIV, were reconstructed by each king in a propagandistic production of the greatness of their own reigns, with new territorial excavation and botanical implementation in each.[xl] They also provided an enormous place for the monarchy+ to self-sequester from the disease associated with other social statuses.

Visiting the grounds of Versailles today, the opulence of the monarchy continues to impress upon the masses through the scale, management, and spectacle-making nature of the Versailles project. The gardens and their aromatic corridors endure as a production of monarchical supremacy through the materialization of colonial accumulation and spatial difference.

The court of Louis XV (1716-74) set an epochally resounding monarchical standard for perfumery when he came to the throne; his court was called *la cour parfumée* (the perfumed court), and he demanded a different fragrance to condition his apartment every day. He revived amongst the French aristocrats a love for strong, spicy fragrances, which incorporated all forms of animal musks. This was evident in the *messe musqée*, the musked mass, held in his court before dinners. In combination with other animalic notes, ambergris conditioned the tone of XV's olfactory presence in Versailles—suffusing the air with the boons of imperial exploit.

By the middle of the eighteenth century, musk, civet, and the intensely animal aromatics had fallen out of fashion to be replaced by indistinct blends of often floral scents. Musk began to arouse suspicion around cleanliness, indicating a desire to hide something (Stamelman 63). A preference for essential oils extracted from flowers merged with a sense of 'good taste.' (Corbin 1986, 68, 74) Madame Pompadour, Louis XV's lover, for example, wore a blend of iris, sandalwood, and rose.

Transitioning from the obsession with ambergris in the courtly scents of Versailles in the early 1700s, we can trace Marie Antoinette's role in the later 1700s in moving luxury olfactory taste toward floral scents, a transition that would later diffuse to the rising bourgeoisie throughout the 1800s. The last dauphin of France, Marie Antoinette, is infamous for spending heavily on fashion, luxuries, and gambling amidst widespread hunger, suffering and financial crisis in the rest of France. She provides an icon extraordinaire for the perfume industry's training of olfactory meaning, the larger context in which ambergris would become activated anew at an industrial scale for a modern olfactory palette.

It is said that Antoinette's marriage to the Dauphin boosted France's luxury trade beyond the wildest expectations of merchants, making make-up a discussion amongst the Ministry of Finances (Feydeau 2006, 18). Clothing, and the behaviors enacted within, constituted a most mobile, visible marker of social status. [xli] Among her full repertoire of glamourous affects, Marie Antoinette had an exclusive, personal perfumer for 14 years—Jean-Louis Fargeon.

Fargeon met Antoinette at Versailles by gifting chamois-colored kidskin riding gloves perfumed by violet, hyacinth, blood-red carnation, and *jonquilles a la Reine* dipped in white wax and almond oil. Prior to this gift, they say the queen ordered no fewer than 18 pairs a month. He followed up by giving her bath sachets made of blanched sweet almonds, pine nuts, linseed, marshmallow root, and lily bulb—recommending that her bath attendants heat water from the river, pass it through a mill wheel, and then throw the sachet in; the queen should sit on the large one, and the other two containing bran should be used to rub her body.[xlii] Slowly, he created for her more ritualized perfumed items (perfume did not yet singularly delimit a liquid in a bottle as a practice): scented cleansing pastilles of myrtle, spikenard, water lily and blueberry, and horse hair and gauze hair bouffants with perfume powder starch and pomade.

He soon began creating bespoke scents for her to match the variation of her moods and personalities. As with the rest of her fashion choices, Marie Antoinette's fragrance selections reverberated as a new trend amongst the aristocracy. She favored floral fragrances, and perfumery around her adapted to her preferences for a style of clean bouquets. She liked the simplicity of lavender, placed in earthenware dishes throughout her apartments to purify the air. For her body, rose, violet, jonquil, and tuberose were distilled after prolonged infusion in spirits and intensified with ambergris, musk, and oppopanax. She liked most *espirits ardents*, piercing spirits, which were expensive due to the increased quantity of raw materials and labor time. In 1778 alone, she spent over 200,000 livres on perfume.

Within a 19th-century positivist, French aristocratic sensualist philosophy wherein sensation was evaluated as the most important form of cognition, perfume application heralded an enlightened palette of privilege. Perfume application became mobilized from medicinal praxis to an activity of commercial iconography. At first among the aristocracy, perfume was enjoyed as a status signal and, analogously, a fashion accessory rather than for protective prudence.

The perfumes of Jean-Francois Houbigant, Fargeon's competitor, also accompanied the walks of the royal family and their consorts. Founder of the second perfumery in France, and originator of the first acclaimed synthetic perfume in the next century, Houbigant became emblematic for bespoke perfume production and was, in a sense, one of the first brands. He had owned a modest shop in Paris starting in in 1775, a time when the fashion for perfume, powders, and blushes was blossoming in popularity because of the stench in the streets of Paris. *L'eau d'Houbigant* was an early fragrance composed exclusively from flowers, and Antoinette was known to covet both his *Espirits Perçants* and *Créme de Rose aux Limaçons.*

Houbigant worked his way into this community of merchants who were licensed to make and sell perfumes (as codified originally by Philippe II in 1190 and renewed by Louis XIV in 1656). These took the form of powders, ointments, soaps, scented water, gloves, mittens, and knitted leather. The statutes in this community required four years of education, with a cost of 50

pounds, followed by three years of apprenticeship and a cost of 550 pounds for certification. He is one of the first perfumers to raise the profession from a guilded, craftsman status to a socially elevated position. In 1829, he was appointed the perfumer of Princess Adelaide d'Orleans, mother of Louis-Phillipe, and during/after the Revolution, he became the licensed perfumer for Queen Victoria and later Czar Alexander. Houbigant's name still stands as an icon today thanks to the eponymous industrial-scale global perfumery owned by the Perris Family and housed in Grasse.[xliii]

For her spatial excess, Louis XVI had given Marie Antoinette Petit Trianon, a smaller chateau on the grounds of Versailles that she renovated according to her own tastes shortly after his coronation. Rumors circulated that she had plastered the walls with gold and diamonds. Marie commissioned an abbreviated fantasy of a bucolic peasant village in the surrounding acres for intimate hosting and recreation adjacent to her private retreat. At the *Petit Hameau,* the Queen's Hamlet, one can sense the queen's out-of-touchness, childish imagination, and superfluity, her imaginative territory of everyday farmhand life. There are a windmill and sheep and raspberry bushes that the labor tended to, mostly out of sight. The trees, supplanted from exotic locations world-round and made to live locally, including the first Sequoia in France, might have broken the seal of the fantasy had the frivolity not been exactly the point. The sequestered space allowed the monarchy to distance itself from the crowd in the same measure as any other breath of a shared national reality.

During the Revolution, Marie became known as *Madame Déficit* as the country's escalating financial crisis was blamed on her lavish spending and opposition to social and financial reform. French people blamed her for the degrading economic situation, suggesting the country's inability to pay off its debt resulted from her wasting the crown's money. Royal household spending was 13% of total state expenditures in 1788.

Legend has it that when Marie Antoinette was caught at Varennes trying to escape the revolution, dressed as a plebian in an unadorned carriage, the intercepting revolutionaries identified her aromatically. Again, only the aristocracy wore perfume at the time, a punctuating spatial difference that must have been pronounced and redolently apparent; they say Marie Antoinette carried a huge bottle of Houbigant with her upon departure, and in this way, they found and named her as she had classified herself.[xliv] I have read that in her travel kit were orders of *parfum du Trianon* by Fargeon, his *poudre a la Fargeon*, a few bottle of *eau de lavandei, eu celeste* and *eau souveraine.* For this particular journey, she supplemented these daily fragrances with *eau de fleur d'organes, spirit de lavande*, *essence de la bergamote, and* various heliotrope and lemon lotions. (Feydeau 2006, 90)

A perfume, *Black Jade,* is rumored to have been conveyed to Marie throughout her imprisonment in the Temple Tour of Paris. In a singular dark jade vial, Fargeon had mixed rose, iris, jasmine, tuberose and orange blossom, and bergamot, along with wood notes and ambergris, in reference to her private escapist gardens at Petit Trianon.[xlv] In 2005, Francis Kurkdjian, a perfumer in a contemporary pedestal conditioned by Houbigant, recreated Fargeon's scent from its formula in the *Osmotheque* archive, a perfume history preservation institute located on the grounds of the ISIPCA perfume school outside the gates of Versailles. His perfume, *Sillage de la Reine*, "in the wake of the queen," employs olfactory poiesis, a historical spatial imaginary, to the follow the scent trail Marie might have emanated before and after the passage of her body.

But, like many perfumes, the name is rich and layered in meaning. In discussions of Marie and Louis' capture, references are often made to the bottles of perfume she hoarded into the carriage as she fled. Dressed as peasants or at least common folk, in a basic carriage, the reagants' departure was meant to throw the trail; the gossip of the betrayal of her olfactive signal offers a pleasurable irony to the function of perfume at the time. Kurkdjian is touted to have created a "ghost of a perfume," an interpretation using natural products in all their geographic variability.[xlvi] Sold for €8000 in ten Baccarat crystal bottles and €350 for a limited 1000 bottles in less dramatic packaging, *the queen's wake* makes yet another point: that royal difference and the wistful imaginary of it dies hard, that it remains out of reach, and that emulation remains in rule.

Territories of Feeling

> The putrid was about to become an image reflecting a social form of life as a typical form of nature
> -Alain Corbin, *The Foul and the Fragrant*

> The bourgeois does not employ his wealth to make a show, but rather is obsessed by the desire to legitimate his position, the bourgeois now envied and tried to emulate aristocratic nonchalance.
> -Robert Mauzi*, L'Idee du Bonheur*

A previous taste epoch for animal musk inverted in the 19th century in a manifest intolerance for the excesses of elite luxury and the bodily emanations linked to disease, crowding, and class. Sanitary measures to clean the streets and regulate sewage emerged in Paris at this time, in a consolidated state of scientific and historical miasmatic reverberation concerned with the porosity of the human body and populace. Jonathan Strauss, a historian of urban death in the 19th century, writes, *hygiene was not…just a matter of practical measure for safeguarding health, it was a key element in elaborate conceptual, political and experiential structures that expressed themselves through urban space.* (Strauss 2012, 6) Where slaughterhouses, gut dressing works, and tallow melting houses had provoked olfactory alarm in the previous century, new industrial-sensory anxieties focused on factory emissions. Fabrication of Prussian blue, strong glue, and poudrette conditioned workers' bodies and neighborhoods, becoming a new sensory-spatial mechanism of social differentiation. (Ratcliffe 1990, Barles 2014)

The enhancement of property values linked to the proliferation of bourgeois wealth and legal institutions in the late 18th and early 19th centuries intensified regulatory pressure on affective/sensory aspects of rising middle-class neighborhoods.[xlvii] Carbon combustion from the coal industry plumed new anxiety about the urban milieu, this time according to a bourgeois valuation criterion. (Albright and Huybers 2023; Fressoz 2007) The privatization of latrines, the rise of public housing, and social division defined laboring classes and neighborhoods by stench-- the smell of the proletariat—in parallel with industrial development. (Goubert, Barraque and Hartemann 1985; Vigarello 1985).

Scent qualities linked bodies and space alike in articulations of class, and, in the long transition from scent as a practice of pharmacy to perfumery at this time, new material-signal commodities

reflected the emergent place of the individual subject within the discourse of class hierarchy.[xlviii] The elaboration of deodorization as a tactic against the imbroglio threat of miasma and the crowd doubled as a palliative assertion of a hierarchical 'I'— as the bourgeoisie followed aristocrats in the pursuit of positional harmony above the stinking masses. Corbin writes, "The new effort to monitor stench inside the dwellings of the humble was inseparable from the development, among the bourgeoisie, of a system of perceptions and a model for behavior in which olfaction was only one component. The sudden awareness of the growing differentiation of society was an incentive to refine the analysis of smells. Other people's odor became a decisive criterion."[xlix] (Corbin 1986, 143)

Of all the senses, smell inflected the existence of an individual subject, conceived as the "contraction of the whole self around one single point." (Vicq-d'Azyr 1775, 8) Scented commodities were not only *utilized* to perform class positions but were constitutive of bourgeois identity (Corbin puts it like this: "the bourgeoisie could now uninhibitedly ape the aristocracy and pursue the accumulation of symbolic values." (Corbin 1986, 198). *Taste* is another way to name this public praxis. Ben Highmore writes that taste "is the orchestration of the sensible, a way of ordering and demeaning, of giving value and taking it away" (Highmore 2020, 126). Taste is the composition and curation of perceptions of cleanliness and dirt, purity and impurity, shame and comfort, the social ontology of bodies. It is an imbrication of sense and status, a central evaluative aesthetic discourse through performances of discernment and disdain.

In 19th century France, the popular praxis of private hygiene was sketched out: lotions, sprays, recipes, and cook/guide books orient domestic sensory practices and elaborate toilette rituals. Toiletry objects and perfumes promoted grooming activities affecting the use and sense of private space, the body, and the presentation of an outward self as a curated atmosphere (perfumed boxes, baskets of scent, pomades, powders, scented waters, the development of a boudoir and mirror all emerged in the 19th century). An evolving geography of the body was articulated in the ritual of the toilette as hands, feet, armpits, groin, and genitals received more scrutinized time and attention.[l]

A new predilection for scented waters extracted from flowers emerged then, reverberating from the later years of Marie Antoinette's court. The queen consolidated and extended a set of botanic behavioral patterns in both the court and the surrounding grounds- honeysuckle wildflowers, buttercups, hyacinths, jonquils, lily of the valley ranunculus. Her proclivities set the tone for a cult propagation of violets which would soon be taken up by a Napoleonic sensibility. Through perfumery, an old trope flashed forward as a new material alliance was forged between woman and flower, conferring a link between nature and a social-biological materialization. This trope also articulated an erotic science of modesty.[li] These ideas are inseparable from the commodities of the time as a new scale of lotions, ablutions, and scented products appeared, the market of which was met by the intensified cultivation of aromatic plants around Grasse and the formalization of perfumery as an industry. It is towards Grasse, then, that the next epoch of global ambergris harvests would flow.

In *The Material Practices of Glamour*, Nigel Thrift locates a rise in the public production of internal individual identifications (what he calls 'public intimacy') in the mid-18th century in

Western Europe—a time characterized by a decisive moment in the popular fusion of sensibility and taste, a nuanced moment of *binding of the affective and aesthetic in a code constituted by private passions communicated in the public sphere*.[lii] Thrift is getting at an entwinement of economic production and somatic experience, wherein class performance and civil space became assembled in a new way through a new regime and scale of commodity production. Commodities, in this articulation, are loci of personal passions and public codes; they tether the presiding ideas of a collective and its historical unconscious, too. Commodities thus objectify and intensify class, gender and ethnic repertoires—at the level of individual or subjective engagements.[liii]

The imagination, the felt, and the material are often ineffably entangled. Commodities are a substantive part of the creation of the geographical territories that enact and distribute positions and, in the same move constitute sensory space.[liv] Spaces, identities, relations between people, and between people and place are made through the use of objects. Perfume is a commodity extraordinaire for its generativity of social worlds and bodies: *territories of feeling* that at once evoke historical positions and constitute what is "natural" in the present.[lv]

In this chapter, I have made several first moves connecting objects, smell, space, and class subjectivity— and thinking about the air as a political, bodily milieu. I looked broadly at a breadth of corporeal attunements to ambergris in taste/fashion as constitutive of imperial and early industrial geographic conditions. I then traced how historically reverberating fear of miasma alongside aristocratic emulation carried through to new class patterns of scented commodity use in domestic ritual around the 19th century. I focused first on how the concept of the logic of airborne pestilence informs a politics of emotion that shapes regimes of spatial and bodily composure: in broad wafts recalling the perfume of Marie Antoinette, pomanders used to ward off disease, and a breadth of nascent bourgeois identity positions expressed in the rise of cosmetics, I have explored a diverse historical political context that is carried forward in ambergris and the legacy of social, spatial difference that perfume instantiates. Ambergris is plastic and remade, accruing value from a maritime extractive legacy as from a historical conjuncture of class and hygiene, all articulated in olfactive tones.

Chapter 3

The Nose that Composes:
An Industrial Sensory Landscape

The Double-Entendre Nose

Perfume is a magical commodity of historical, geographical sensorial assembly. Multiple milieux are carried forth in its legacy, and ambergris—a biogeographic condition of sperm whale metabolism, a commodity of imperial extraction, a talisman for reagants and plagues—is memorialized and invigorated anew as an industrial material for mass perfumery in France in the 19th century.

At the same time that ambergris is made available at scale through the labor of the New England whaling industry, the town of Grasse, France, emerges in parallel as the material-semiotic epicenter of modern perfume production through the iterative development of regional technologies for aromatic material extraction and corroborative practices of classificatory expertise. The shift from artisanal fabrication to industrial manufacturing conditions the rise of the nose: its functional entrainment as an organ of discernment and institutional elevation as a composer of market taste.

In this chapter, I explore the production of ambergris as it is made as a scent note and fixative for a burgeoning global industrial perfume industry through its historical rise in Grasse, France. I trace other olfactory material and pedagogic centers that ambergris activates in a modern perfume production constellation. I query its rationalization as a formal aromatic material for industrial perfume production, properties of which are arbitrated by a new clade of olfactory experts in fragrance factory settings and nose training schools as perfumery emerges as a mainstream commercial object.

Grasse has occupied an enduring, authoritative role in producing olfactory materials and knowledge about them together since the rise of industrial perfumery in the late 19th century. In turn, the exigencies of mass perfume production iteratively shaped the meaning and quality of ingredients . In the process of severance from a heterogeneous milieu and territorialization in the chemical laboratory, ambergris—and perfume materials more generally—are translated into rational, regimented, repeatable units. The ubiquity and factory contexts seem to separate the olfactive commodity units from the geographies or milieux of their production, promoting them as ahistorical. And yet, the transformation is articulated in specific times and places through the elaboration of regional perfume factories, material processing technologies, and theories of formulation in perfume schools. Together, these mechanisms formalize the conditions of aromatic production for industrial, global production.

New markets and modes of production necessitate new means for standardizing the perfume object. I argue herein that the nose itself is made in a particular time and place, as the rise of industrialization motivates the need and possibility for making more—more objects, more surplus, and more conditions to produce both. Ambergris is made anew in the olfactory framework of industrial production, and its codification by the nose becomes the central means for creating the possibility of equivalence. The nose determines quality and purity; it *makes* rather than finds essence. It gives essence comparative form and value. And, again, it does so at a certain moment of material change to ensure its value.

I enrolled in a breadth of perfume classes to understand how the nose creates value, of essence and relation otherwise. Across classes in Grasse and the contemporary compositional pedagogies it has inspired more broadly, I studied how olfactory matter is created through sensory-taxonomic training. I attuned to how practices of sniffing and mixing work to standardize olfactory affects; I explored the principles and practices by which the nose is trained to assemble olfactory truth and possibility.

Through instruction in perfume school and visits to other experts in raw olfactory material evaluation and circulation, I examined how the nose is employed in situ to reinforce and mobilize classification structures conferring continuity of material essence as aromatic production moves off the land and into the lab. In the following pages, I visit the fragrance fields, factories, and classrooms alike to trace how ambergris is assembled anew as an ingredient for perfumery in an extended timeline of olfactory industrialization.

An Elemental Landscape

> Horticulturists being generally unacquainted with the methods of economizing the scents from the flowers they cultivate, entirely lose what would otherwise be a profitable source of income. For many ages the Cornish miners, while working in the tin streams, threw the copper ore over the cliffs into the sea. How much wealth was thus cast away by ignorance, we know not; but there is a perfect parallel between the old miners and the modern gardeners.
> -G.W. Septimus Piesse *The Art of Perfumery*

> Our century will link the reign of individual force, with many original creations, to the reign of uniform force, which by leveling, trimming products, swamping markets, and obeying a unitary idea, is the last expression of societies.
> -Honoré de Balzac, *L'Illustre Gaudissart*

Grasse, a town in the Alpine foothills just north of the French Riviera, has been the material and symbolic capital of the perfume industry since the 19th century. Its specific geographical context: an 18th-century landscape of aromatic flower cultivation combined with the following century's augmentations of material processing technologies—and the attendant elaboration of perfume compositional expertise—have together conditioned the rise of perfume as a mass social form. The valuation of ambergris as a prized scent note and fixative is articulated in Grasse at this same time. Perfume houses and their consequent Noses in Grasse have long appraised the qualities of fragrance industry forms, and producers there have maintained the region's authoritative dominance over olfactive values as a world synthetic palette emerged.

Built into a subalpine maritime microclimatic hillside, roads climb and wind between silent estates, and in the times I have been there (mostly during flower harvest seasons—rose in May,

jasmine in August), the sun vibrates endlessly. In pieces of shade, a breath of Mediterranean uplift presents a historical consciousness concerning the geographic conditions of aromatic cultivar labor.

Late Medieval Grasse participated in a regional tannery economy, a trade buffered by an abundance of fresh alpine water siphoned into human drainages like that in the central *Place des Aires* in Grasse, which was once a broad canal for channeling liquids of urban trade. Beyond the brain tan, leather was softened with fatty, scented pastes from hot enfleurage, a saturated botanical pomade process. With an excess of regional flower cultivation, glove makers built specialized boxes for their leather goods stacked with flower petals, each carrying their own maker's insignia. Shoes, belts, gloves—all leather products—were perfumed.

During the second half of the eighteenth-century royal interference and regulation decimated French tanners' guilds, and the royal taxes on leather crippled the leather industry. By 1791, the *d'Allarde Law of 2 March* and Turgot reforms abolished the guilds, a reform that ostensibly allowed any individual to buy a license and practice a trade.[lvi] A space for alternate regional industries opened in the wake of leather work's decline, and exploitation of olfactory value from the already extant flowers increased as new processing methods emerged, based especially on steam power in particular.

The glove makers in Grasse were organized in guilds, an early form of organized labor somewhere between union and legal brand defense, that shaped work opportunities and regulated markets. Leatherworkers' social status ranged from wealthy tanners to poor cobblers, and the leather trade corporate groups mediated considerable conflict across ranks. Master craftsmen across competing guilds and manufacturers, each with their journeymen and *compagnonnages*—aspects of social differentiation in that labor that carry forward through new economic arrangements articulated by the rising perfume industry.

Investment in large flower plantations grew in and around Grasse in the latter half of the 18th and early 19th centuries to supply specialized perfume manufacturers with raw materials. The Chiris factory was established in 1768, then Lautier in 1795, Roure in 1820, Mero in 1832, Robertet in

1850, and the Société des Parfums Naturels de Cannes in 1883. Some perfume houses, like Piver, integrated their own raw-material processing factories into their businesses to reduce costs, a strategy adopted by most perfume retailers, especially after 1850.[lvii]

The fragrance house of Antoine Chiris (1768) was the first regional enterprise to make an industrial business model of harvesting botanicals and turning them into raw materials for perfumery. Chiris generated patents on steam distillation processes that enabled large-scale production of high-quality essential oils at lower costs. This technology helped establish Grasse's function and reputation as a producer of perfume process necessities early on. Chiris invested in land parcels around Grasse before the revolution—titles he sustained despite broad reform and passed on to his son Leon. Chiris quickly expanded operations globally through ownership of foreign fields and manufacturing facilities by developing foreign agents and subsidiaries. He expanded production to perhaps every French colony — and elsewhere, including the United States. By 1850, Grasse had global reach and an authoritative position in perfumery.

Today, fields of Grasse's historic cultivar are seen everywhere: lavender, rose, jasmine and tuberose. Every billboard from miles beyond town depicts them iconographically from rasterized historical archives; the text *Perfume*, the image of the still, the positioning of village scale copper alembics, processing factory flumes in the distance—each of these punctuate any vantage point, indexing those historic raw materials and their transformation into the renovated olfactory object of perfume. From the time that I first visited Grasse in 2016 to my most recent visit in 2022, both of the small-scale flower growers/ hand-craft essence producers I visited have since sold their parcels and moved due to increased property value and tax; ask anyone in town and they will tell you something to the effect that Chanel and Dior bought up any parcels available for of cultivation of rose and jasmine, which comprise some insignificant percentage in their blends being used primarily for symbolic value. And whether on a bus, in a car, or on foot, the vestiges of an intensively cultivated landscape persist too in the gated, barb-wired, security-manned, surveilled, and seldom-windowed perfume corporation compounds like *Robertet* and *Mane* that hunker across the region—presumably sites exempt from biogeographic history.

Grasse in the 18th and 21st centuries: tuberose field and perfume factory.

From Distillation to Extraction: Technological and Taxonomic Moves

In the 19th century, perfume evolved from a paradigmatic object of exceptional use into a more broadly distributed and widely consumed commodity. As I noted in Chapter 2: *Object Affects*, attunement to smell increased in popular cultural practice as hygienic routines proliferated in this epoch. Where Alain Corbin has linked this materially to the development of water networks and the integration of bath amenities within houses and apartments, perfume products are also powerful cultural signifiers that the bourgeoisie used to differentiate themselves from 'common' people.

Perfume was traditionally an exclusive product, values of which were based largely on the price of raw materials. In 1789, the perfume trade suffered both in its finances and its reputation in the upheavals of the French Revolution (see chapter 2 re: Marie Antoinette, etc.); it adopted an almost entirely new life during the nineteenth century. In the 1860s, technological innovations adopted by perfume manufacturers included new techniques for extracting raw materials faster, cheaper, and in larger quantities. As in many other sectors, steam power became a central power source helping to replace historical techniques like enfleurage with the more intensive solvent extraction, a boon to this industry's development.

The olfactory qualities and ways of using materials changed with the means of production. The means of extraction shape what the material is, how it smells, and how it is used and the way it performs in a blend. One of the main historical techniques for extraction was enfleurage, hot or cold, a technique developed in Grasse. With enfleurage, fragile floral fragrance materials were treated (cold) by being placed face down in tallow and sealed for hours or days at a time, with flowers traded out for the duration of the blossom season. Fats would absorb the volatile fragrance and then get mixed with alcohol, breaking down the relative parts and evaporating. Hot enfleurage, also called maceration, is a process that infuses flowers or other vegetables in oils and fats and is heated to 40 or 50 degrees. After 24 hours, the fat is recovered by draining it through large sieves and cloth filters; the congealed matter is then washed with alcohol in threshing machines. Hot enfleurage was primarily used for rose and orange blossom processing, yielding a thick and potent olfactory paste called an absolute.[lviii] This method was labor-intensive and expensive, and was therefore abandoned and replaced by extraction with volatile solvents and then with C02, both developed in the Chiris factory.

With volatile solvent extraction, flowers are placed on large plates and stacked on different levels in a large extractor, then submerged in a solvent (ethanol, hexane, benzene, respectively, as well as other naturally highly volatile substances, were developed in chronological order), which later evaporates, thus separating the olfactory compounds. In the 19th century, hexane was applied to fresh raw materials, such as orange blossom, rose, jasmine, mimosa, and ethanol was used for dry raw materials, gums, resins, and beeswax.

The audio guide at the Molinard Perfume Factory Museum in Grasse, the second oldest perfumery in Grasse (and France) after Galimard (1747), notes that before steam solvency technology, some 350 kgs of harvested roses would yield 1 kg of concrete or absolute via en fleurage, and around 3.5 tonnes of rose, distilled for 12 hours, yielded approximately 1 kg of rose essential oil. In 1880, volatile solution baths doubled that quantity, yielding 1 kg of rose absolute

from 650-750 kg of flower. Narcissus, mimosa, and jasmine underwent a similar processing increase. Today, 1 kilogram of flower absolute from Grasse costs between 750,000 and 100,000 Euros, with jasmine at the lower base and iris at the top.

Grasse women stir a vat of hot enfleurage in the 19th century (left); Industrial technology like solvent extraction (at *Robertet* in Grasse, 2008) increases yield while decreasing costs and time for labor.

From 1883 onwards, the extraction of aromatic raw materials by volatile solvents mostly replaced traditional water distillation and largely replaced enfleurage, increasing yield and saving energy/production costs. The Société des Parfums Naturels de Cannes soon specialized in this technique, describing the process as "realizing a more complete extraction of scents, and, as a consequence, a reduction in the cost price, by substituting the technique of methodical extractions to one of repeated enfleurages." (Briot 2011, 279) Economic considerations, rather than arguments for quality, convinced the Society's client producers to adopt the new techniques.

As processing and production capacities expanded within the industry, perfume houses like Chiris extended the family's perfume operations globally through the appropriation of foreign fields and manufacturing facilities and through colonial development of foreign agents and subsidiaries. Outside of Grasse, Chiris factories were developed in Calabria, Sicily, Tunisia, Congo, Madagascar, Comoro and Bourbon Islands, Guyana, and China. He imported musk from China, star anise from Tonkin, benzoin from Cochin, China, patchouli and lemongrass from Indonesia and the Philippines, and ylang-ylang from Madagascar. With the solvency process expediting production, Chiris processed aromatic raw materials from geraniums, orange trees, cassias, and eucalyptus in Algeria and France alike, generating a modern global olfactory palette alongside emergent synthetic yields at an exponential rate.

After 1880, the introduction of synthetic compounds also contributed to lower production costs and expanding consumption among new categories of customers, the development of which is expanded upon in the next chapter. The exigencies motivating and orienting the industrialization of scent in Grasse directly paved the way for the chemical production of fragrance and also shaped a differentiated market, simultaneously making perfume more 'democratic' while also articulating a mainstream luxury sector. Both phenomena converged and reached their height in the 1890s with the emergence of perfume bazaars and other means for publicizing perfume products and brands.[lix] (Briot 2011; Jones 2010)

Septimus Piesse, a 19th-century English perfumer and chemist, was a leading author and an innovator of modern perfume ideas in his time. His book, *The Art of Perfumery,* provided an initial outline for extraction methods and the ways these shape blending practice in perfumery. It also popularized the use of synthetics. In 1891, he celebrated, albeit ambiguously, the new fragrant forms for the social sensorial difference that olfactory industrialization enabled. He writes,

> Thanks to chemical compounds, perfumers and soap-makers could establish products at much lower prices, which immediately brought in new customers. One of the outstanding features of the social history of our time is the ascent of the humble classes towards a wellbeing, a luxury, as we could say, until then reserved only to the privileged. This trend was particularly obvious in the case of perfumery. Today, the humblest craftsman uses perfumed soap, which he or she can obtain at infinitesimal prices. The use of eau de Cologne, aromatic vinegars, eau de toilette, handkerchief extracts, is widespread. This growth of production was made possible thanks to the resort to artificial products that, for a modest price, offer perfumers a considerable olfactory power. (Piesse 1891, 193)

The conceptualization of scent 'notes,' a classification unit that organizes a larger relational taxonomy, is Piesse's central and enduring contribution to perfumery. It is a structuring principle used universally in perfumery today. Piesse identifies olfaction in correlation to musical notes on a diatonic scale; in other words, he created a system for categorizing and ranking diverse affects in common. I quoted Piesse at the beginning of this section for his framing of scent as a thing to 'economize.' He likens gardening to the missed opportunity to monetize the copper ore discarded as waste in the process of aluminum mining. In other words, he argues that the absence of a utilization taxonomy (a kind of ignorance in his framing) imposes economic loss. In the second part of this chapter, I expound on how the creation of notes and the systematization of their properties organizes the sense of smell and its possibilities for creation; I show further how the classification principles established in notes not only structure compositional practice but also provides the scaffold for the correlation of essences and the practice of olfactory fungibility.

The shift in the value of fragrance products from their basis in the cost of raw materials to a broader symbolic level is the focus of Eugenie Briot's 2011 article, "From Industry to Luxury: French Perfume in the Nineteenth Century." In it, Briot develops an economic reference for industry shifts, noting that by 1810, the perfume trade in France represented slightly less than 2 million francs and that by 1912, the value of its assorted products had risen to 100 million francs. In the short period between 1880 and 1890, production increased dramatically, rising from 45 million francs in 1878 to somewhere between 70 and 75 million in 1889. [lx] Alfred Picard's report on the Universal Exhibition of 1900 in Paris also provides figures for the significant growth of perfume product sales in this time: 12 million francs in 1836, 45 million francs in 1878, between 70 million and 75 million francs in 1889, 80 million francs in 1900. (Picard 1891)

In France, perfumery started to achieve market dominance as an industrial commodity through technical innovation and carefully considered management strategies that prioritized cost reductions to widen margins, while differentiating their products through the conferral of symbolic value. Given the reduced production costs assumed in the industrialization of the craft, particularly reproduction in petrochemical derivatives, the continued conferral of luxury value was essential to the industry. With the development of synthetic fungibility—the replacement of parts and notes with substitute materials forged more cheaply—perfume started to rely on the

generation of semiotic and symbolic values that did not revolve around traditional binaries of genuine and fake, natural and artificial.

Perfumery achieved new social signification through various forms of cultural and economic integration. Capital started to attach to perfume anew through the names of (latent) corporate brands and their associations rather than in relation to a monarchical model of arcane colonial ingredients and the singular creator. Emergent industrial-scale luxury brands replaced the independent perfumers of the reagants' time and eventually assimilated into fashion house lines. Perfumers also started to play a newly visible role in public life towards the end of the 19th century as representatives of high bourgeois society through their patronage; one sign of their rise in bourgeois social status is the appearance of several Parisian perfumers among the members of high society listed in the *Tout-Paris* yearbook at the end of the century. (La Fare 1885) Beyond their inclusion in a select social network, perfumers were also distinguished in Universal Exhibitions and by the state in the form of Legion of Honor awards.[lxi]

A system of symbols—name, bottle, label, advertisements, the boutique in which it was sold—generated a commercial rhetoric part and parcel with aroma. (Photos my own at the MIP, Grasse)

Newly elaborated labels and brand packaging also started to factor into the price and value of perfume at this time. Improvements in both color printing and glass bottle fabrication facilitated the production of multiply ornate objects at new scales. L. T. Piver's labels, for example, were engraved either by Alexandre Brongniard Fils, the director of the Sèvres porcelain factory, or by his pupils.[lxii] The famous jeweler René Lalique also began creating bottles for L. T. Piver, François Coty, and the Roger & Gallet house , both emulating and reinforcing the decorative arts luxury symbolism practiced by the aristocracy and subverting it as a mass distributed form in the age of mechanical reproduction.

While labels, bottles, branding, and production of storylines have proved effective in commodity intensification, the material diversification of the industry necessitated a means by which to confer and endorse the quality of things. Luckily, Grasse was already established as a site of olfactory authority, institutions and individuals of which were activated in perpetuity in the supple exercise of evaluative expertise.

Making Ambergris in a French Regional Economy

Today, Grasse still produces over two-thirds of France's natural aromatic materials, an economy churning more than 600 million euros a year. It remains the capital of modern, western perfume: perfume as a world-milieux abstracted into a palette of olfactory units, perfume as a hyper-designed and decreed set of olfactory referential affects.

PRODAROM, the sectoral trade union for all perfume materials in France, located within the Union of Chemical Industries, is situated in Grasse. It sets standards, including the conditions for harvest and the qualities of extraction; it shapes labor practices, managerial standards, limits on externalities, and terms of trade. The network includes everyone from cultivators to noses in fashion houses, so it reinforces a key material condition for the global practice of perfumery as an intricately networked craft. It is also one of the central institutions arbitrating the value, quality, and parameters for the evaluation of ambergris as it moves out of the ocean and into the hands, and noses, of the French perfume industry.

PRODAROM began in 1724 as a glove-makers guild, the *Jurande des gantiers-parfumeurs* (Wardenship of glovemakers & perfumers), changed into the "Trade Union of the Perfumers-Distillers of the Alpes-Maritimes region" in 1898, and finally into then to the "National Union of the Manufacturers and Importers of Essential Oils, Aromatic Products, Almond oil, and Almond seed oil" (PRODAROM) in 1945—each reflective of circulated materials circulated and their attendant forms of social organization at different times.

In a historic reverberation of the guilds, ostensibly pre-modern corporate societies of order, the perfume industry is notoriously difficult to penetrate. Spatialized in Grasse today, this looks like discrete and private mid-mountain roads, guard walls with barbed barrels, security gates, and keepers; video surveilled front entrances, and approved appointments sponsored by internal hosts that likely require superior's permission and NDA assignations. Yet Phillipe Masse, the President of PRODAROM, a perfume big wig in direct and intimate rapport with any president or CEO of the seven largest global fragrance corporations, occupies a trivial office in Grasse, down a quiet set of ochre steps, through unremarkable gates with faded stencil insignia, on the bottom floor: the most casual encounter with prestige and authority I have experienced across otherwise strictly fortified institutions in years of research.

Mr. Masse's office featured piles of papers in many stacks, an old monitor, golden light, and a historical chalet vista; a delicate wood-wrought leaf sculpture stood in unison with a bespoke 3-D organic chemistry model in elegant wood, all of which appeared casually emblematic of the causal reification of the nature-chemistry elision so essential to the industry. Masse was available to answer any questions, and so I enquired immediately about the institutional legacy of Firmenich, one of the top three 'Big Boys,' global fragrance corporations that had patented the original set of synthetic ambergris derivative molecules in the late 1930s/early 40s and also had a basic monopoly over global fragrance and flavor molecule production (see Chapter 4: Chemical Space for more).

As I came to Grasse to query the rationalization of ambergris, I was interested equally in PRODAROM's position in/on the contemporary circulation of raw ambergris as well as its

relationship to the translation of ambergris into Ambroxan, whether through technological, classificatory, financial, or institutional brokering. When I was probing the political history of Ambroxan, trying to learn about the trans-institutional relations that made it possible, Masse had almost nothing to say to my specific interest in this regard.[lxiii]

Philipe Masse, the president of PRODAROM, the French olfactory raw material syndicate with a 180 lb. piece of ambergris, qualities and values of which are presided over by his organization.

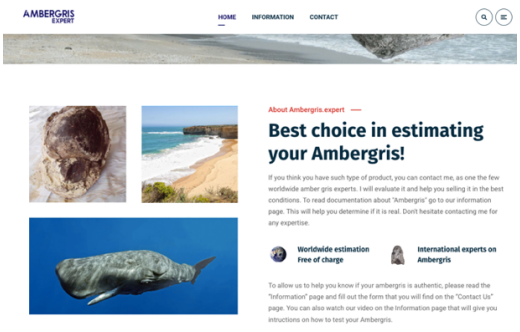
Meeting Masse brought me closer to the beating heart of my inquiry, as he was the President of the contemporary French perfume network that translated ambergris, in quality and value, from an oceanic milieu into an olfactory industrial one. I wanted to know about the process, what he thought about it, and how it functioned.

I had come to Grasse this trip to search for Bernard Perrin, an ambergris dealer who had the only internationally visible ambergris appraisal dealership in Grasse I had succeeded in locating. I had hoped to ask him about quantities and circulations of ambergris, locations from which it hailed, evaluation measures, storage, clientele, stories, or details. I had imagined that these details would not come easily, particularly given the confused mainstream perception of the legality of ambergris circulation given CITES, a multi-national treaty to protect endangered plants and animals from the threats of international trade (1975) that restricts all circulations of cetacean life but identifies ambergris as an object already separate and therefore legal. While aged ambergris fetches a higher price, fresh ambergris is still highly valued, and it is underdetermined what global quantities are harvested from fresh kills.

Perrin's website had been a vague mirror for the ethical indeterminacy of the curator on the one hand and for the determinate industrial-financial values of ambergris on the other. Both ethic and price correlate to a visual-olfactory tonal spectrum, white to black. Aged pieces, white ambergris, are valued at least double the price of fresh (black) ambergris. Such pieces derive from extended time at sea, through oxidation and brining in sun and gyre whereas black ambergris arrives into a social world fresh from the gut, likely by a kill. The olfactory spectrum between these two ranges from dung (the latter) to refined soft sparkle (the former). Visual and

olfactory tone correlate, and the weight of the mass together with the political economy of a time determine the price of ambergris.

Expertise is the headline of Perrin's website, and his website names him as an expert no less than twice a page—with Grasse referenced, employed to confirm his authority. A person who might come to the page with a found mass of ambergris will find themselves doubly dependent: in classificatory corroboration and closed market mediation.



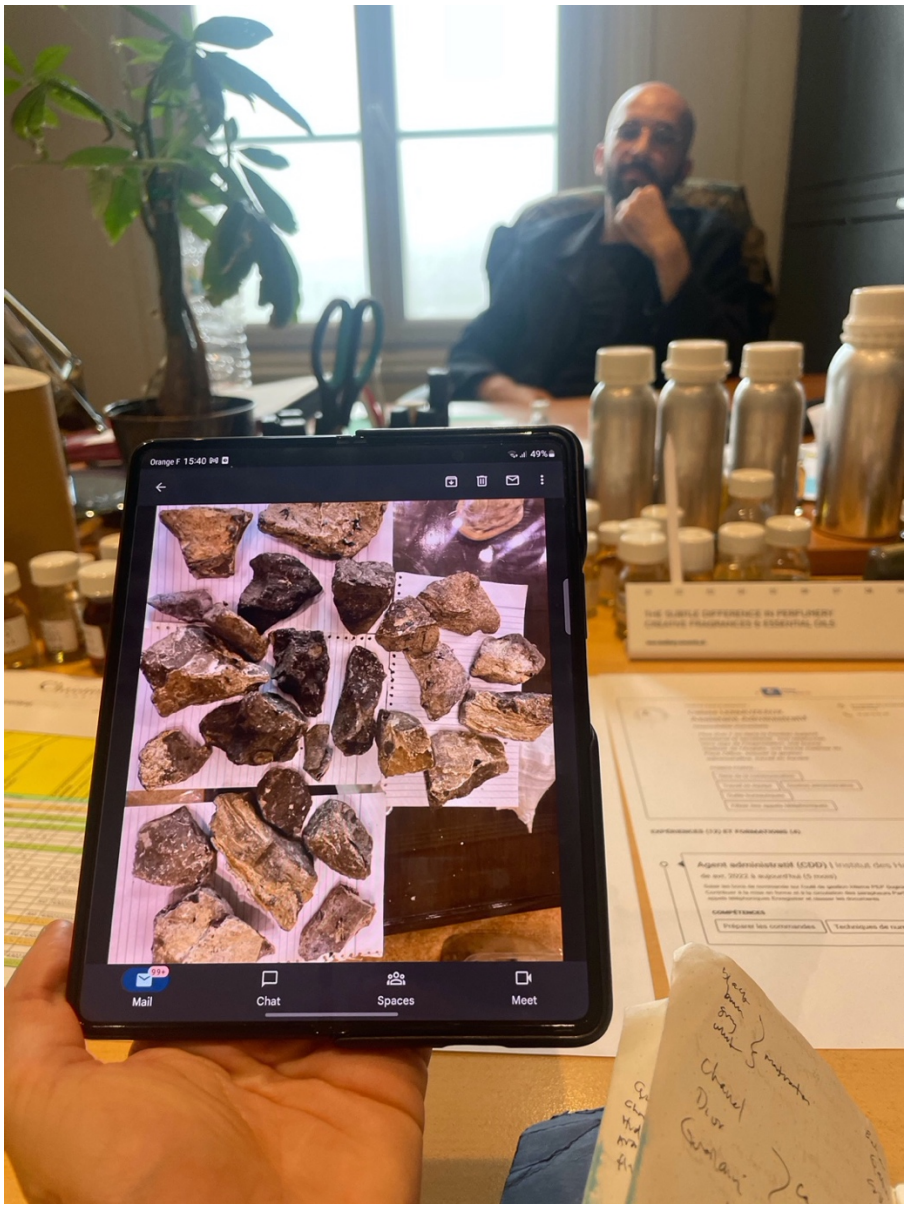
I was curious what the presiding regulator of olfactory matter thought of Bernard Perrin and how he interpreted the stakes of ambergris circulation. In what appeared to me first as a distraction, Masse replied something like*, yes Bernard*, *Bernard Pathe*. I sat up, alert to my inclusion in a tight circuit, proximate to my internal gossip of illicit trade. Masse caught wave of my intrigue and spoke pointedly: *as you know, we don't take it if we kill it.* I asked Masse again about the name, and he said *Bernard. Bernard Pathe,* the ambergris dealer, and he lived in Paris at that. Pathe only dealt with ethical ambergris and would easily meet with me—perhaps precisely due to the fact of his clean dealings.[lxiv]

For Masse's part, he insisted that this network's valuation of ambergris required that *it spend time in the sun and sea to improve quality,* that *it must be floating, otherwise it is not interesting.* The reputation of Masse's network depends on traceable sourcing, so I take this lacuna as evidence of a broad, and broadly discrete, multiply articulated global network of ambergris circulation. PRODAROM, again, unites a network of raw material cultivators and distributors, the organization of which makes sense of the various possibilities of origin and circulation, and develops mores/elocutes values in relation. What I understand from his statements, then, is twofold: 1. That fresh ambergris, dark and potentially extracted by violence and force, has a different, more fecal and ripe smell than that which has aged outside of the body of whale, at sea and on land for years and 2. that the contemporary industry has long elevated the non- extracted form through an olfactory hierarchy based on its seemingly natural olfactory essence, once separated from the life and body of the whale.

***We don't take it if we kill it,* – Philippe Masse & a 180lb piece of ambergris.**

At a small office, a 6-minute train ride outside the official bounds of Paris from Saint Lazare, I met Mostapha, a contemporary ambergris appraiser that works with Bernard Pathe. Together, the two comply with PRODAROM sourcing designations for ambergris, rhetorically straddling a liberal ethics concerned in some way with species loss and a business mindset on sustainability, articulated as a materially stable source of matter. Wherever the providence of the ambergris they receive and deal, smell is the rule.

The multiple levels of codification of ambergris aromatics in perfumery delimit its compositional use and value, and these values become canonized between distributors and perfumers, as the severed matter is interpreted and encoded in a visual, olfactory, pedagogic lexicon.



A catalog of ambergris varieties found & for sale, Fedex-ed, and completely separate from the whale.

Cadima-Pathe provides raw materials to the contemporary perfume industry in Paris and is one of the only distributors of animal ingredients, including civet, castoreum, and ambergris. They distribute mostly to larger perfume houses like Dior and Chanel, for whom such standardization becomes more necessary.

Global ambergris arrives at the Cadima-Pathe offices via FedEx wrapped invariably in paper or white cloth, carry the mass from the global beach, its last bio-geographic touch point before the airdrop in Paris; the cardboard boxes portend its onto-economic translation into a structure of valuation. Today, Cadima-Pathe receives 10-20 kg of ambergris each year, a notable decline from ten years ago when notions of sustainability as animal population count were less pronounced, Mostapha reported. Still, 10- 20kg is significant considering that ambergris use in any manufactured perfume blends dilutes its tincture to a thousandth degree—employing the

‘verité’ gesturally while also depending on a cheaper fixative. Cadima-Pathe’s distribution is wholesale, and they do not sell to small craft perfumers (like me), so aside from Chanel and Dior, who still use it in those nominal amounts, the majority of the market lives in the middle east and India, where it is used in religious practices and fumigation. In naming this market, Mostapha underscored the simultaneity and aggregative nature of its value: its traditional use as a fumigation agent and its contemporary symbolic-affective activation by the chemical industry for molecular reproduction. In both cases, it is proved essential, essentially effective, by its smell.

Ambergris is many things at once, fulfilling many historical and geographical positions at once. Chewing on it, Mostapha reflected on the bounds of the modernization of ambergris and said that *we should look to the ancient knowledge around ambergris not for ‘truth’ per se but to know what it is, as it is to people*. A version of a geographic consciousness? He says *the chemical version identifies an isolated aspect of it, in effect sterilizing it of its history and practice.* I smiled at Mostapha. Ancient Chinese texts reference it as a medicinal cure, and it is burned as incense to fill homes and temples. Incense, he says, is perfume; it is the same thing but spatialized and ritualized differently. Whether or not it ‘works’ in a curative sense is beside the point—the enduring means and methods of its use constitute most of what we know about it. 90% of their sales are to countries like Qatar and India, who use it almost ubiquitously according to historical spatial customs—ambergris is always evolving, and made through the exact context of its use.

For Cadima-Pathe, ambergris is the bridge between the values of the perfume industry that buys it, and the global network of professional beachcombers that gather it. Despite this incomplete assimilation of ambergris into modern rationalism, the cobbled network of Cadima-Pathe assembles a legitimate bid on market stability. Less than 10% of Cadima-Pathe’s ambergris acquisitions come from random beachcombers who happen upon ambergris on the beach. The overwhelming majority of ambergris comes from beach scouring professionals who train their dogs to find it, which is the best and most advanced way to identify it to date.

Professional ambergris hunters hunt it full-time with dogs that sniff it out, the most effective acquisition tactic today, on beaches in Ireland, New Zealand, the Caribbean, the Indian Ocean. Those individual and collectively organized hunters sell to distributors. Cadima-Pathe works in particular with one trade partner in Ireland, one in New Zealand, and one in coastal India. In this closed and known network, the lion's share of FedExes they receive are already largely verified in origin and method of harvest by relation. Mostapha echoes Masse, saying *one does not kill a whale for ambergris,* as its highest quality and value comes when aged by ancient emissions; Mostapha heard a rumor that someone had recently sold some that was 800-900 years old, and the value of that piece is challenging to translate into a financial number.

I smelled a vial of an unmarked ambergris derivative in a small tin vase on his desk—it embodied, or brought to my body, a sense of expanse, a kind of mystery that pushes on the edge of a container, like being underwater, dark water, with plants surrounding you with the sparkles of occasional light. Mostapha nodded *yes* to this verbalization; this particular blend was reproduced with algae and a partial substrate and marine scent note. The synthetic creation of ambrein in patents like Ambroxan, he explained, includes a process of olfactory molecular design that selectively isolates aspects of an otherwise broad and complex aroma; *the chemical*

structure offers an exacting, limited perspective on the diversely rich aroma. Perfumers can elaborate on an impression or interpret and build the fragrance from a selection of related notes (an ambergris accord) to achieve a more comprehensive interpretation, but this, as stated by Mostapha—again a rare materials supplier to a high-end perfume industry—rarely achieves the haunting depths of the actual material. From his particular office in Paris, his elocutions on purity and hierarchy mark and make ambergris in its olfactory verité form.

By delving into the regional conditions that nurture the rise of the perfume industry alongside the institutions and experts that translate nature into olfactory taxonomic values for that industry, I have assembled an argument that the essence of ambergris is produced in time and place. In the second half of the chapter, I focus on perfume's pedagogic principles and compositional practices that naturalize the nose as the mediator of essence, identity, and value across a spectrum of substances.

Pedagogic Objects: Classification and Attunement

The very notion of what smells are, how they are, and nuances in the ways in which we perceive them emerge from historical material contexts. Different technologies and compositional practices create olfactory materials, parsing their relations, identities, and applications. Harpoon and try-work, still and solvent alike, shape perfume's taxonomic and compositional capacities. Ambergris, for example, must be ground, stirred, diluted, and dissolved in alcohol. Its massive wax and multiple congealments must be disassembled by the solvent and then filtered, after which the dilution rests and integrates. The process for dissolving it varies depending on the scale of processing, and particulate fineness, type of alcohol, and dilution ratios will all shape its affective capacity.[lxv] At different scales, ambergris, amongst other olfactory materials, is transformed into new conditions of use for blending, moving matter from its referential origin to its status as a scent note, an ingredient for composition.

The specific, situated practices of rendering olfactory matter (cutting in, dissolution) delimit knowledge concepts tethering the materials and the senses together. In becoming materials for fragrance production, inchoate commodity forms are designed for a specific set of uses which make ontological and performative cuts about what the thing is and can be.[lxvi] Economic aspects become formalized as olfactory and vice versa; these aspects provide the contours of their utility, and for olfactory commodities, it is ultimately the nose that determines the definitions of their qualitative function. The nose's evaluative, knowledge-making, and productive function underwrites most daily aspects of contemporary world olfactory composition.

Even at an industrial scale, perfume is distinguished by the role of the 'nose,' le Nez, a designation of both the organ and head perfumer that depends on a set of discrete, micro, corporeal practices. The nose mediates notions of essence, identity, and value across a spectrum of substances and composition techniques. Whereas I refer specifically to the nose, the human organ, throughout this section, its reference is also a double entendre—naming the celebrated role of the head perfumer, chemist, and concept designer who has been trained to assess aroma.

I trained to become a perfumer to understand how the nose becomes equipped to create and corroborate the essence of things and, therefore, the possibility of chemically essential

equivalents. I wanted to understand the embodied, sensory labors of attunement and discrimination developed in concert with Natural History taxonomic ones and how the same discernment processes were, in effect, marshaled to confirm chemical kinship. My training began at an introductory level at the Grasse Institute of Perfumery and then in more detail in a constellation of perfume schools that follow the training models and practices set up in France.[lxvii] These include a natural perfume school of global regard in northern California and an open-source and online perfume school covering a range of historical and political topics—the Institute for Art and Olfaction (IAO) in LA.

Both schools, in pedagogic comparison and geographical distance, enrich the argument that the olfactory epistemological principles developed in Grasse do world historical work. Both schools, natural and natural-synthetic combined, use the exact same classification standards: top, middle, and bottom notes based on the volatility of compounds; floral, spice, animalic, etc., based on natural historical differentiations; and the compositional structures of the *accord*, which creates broad groupings of likeness and the possibility for subbing-out within a blend (I develop insight on all of these ahead). This durable standardization across time and space suggests that such pedagogic replay is the exact condition for chemical fungibility in the world-scale production of chemical equivalence as Nature, and that such truths must be made and remade in practice in place.

From the perfume courses, I organize my learnings around the standardization of likeness/ difference through practices of sensorial attunement that orders aromatic matter into *notes* (units) and families (relations)—first as visualized in the fragrance wheel (see below) and second in the development of compositional paradigms called accords that structure the make-up of a perfume. I focus specifically on the ways in which ambergris becomes defined as an olfactory assemblage of individual analogous ingredients organized in relation to a broad sensory palette of *amber* (or an amber accord), and secondly, how the olfactory assemblage of the accord articulates ambergris itself as a deconstructed, olfactory palette of units with prospects for fungible replacement of parts.

My initiation into olfactory pedagogy included a thick preparation workbook and a set of 16 scent notes, essential oils, concretes, absolutes, C02 extracts, and isolates. These provided materials and structure for learning to train oneself according to a systematized language. Workbook training was organized around what I am calling *attunement*, something like self-extension or opening through subtle listening. Exercises in the workbook built progressively from sensitizing one's nose, one's whole embodied attention really, to a single aromatic note at a time as characteristics of it emerge and conform to an etymological palette: colors, intensities, shapes, textures, flavors, other food and plant analogs, memories, bodily sensations. Each scent is dynamic, broad, unique. The facets appear, morph, perform in their own unique temporalities, and dissipate in the dense seconds of olfactory duration.

Part and parcel to building an intimate recognition of individual notes, the practices of attunement are also practices of identifying relations mostly along striations of likeness: likeness in color, similarity in texture, correspondence in peaks, troughs, and durations of olfactory intensity. A perfumer and nose are always attuning to individual identities with attention to how individual characteristics will participate collectively in a blend. Perfumery is about elevating

the ingredients in assembly, and the perfumer is tasked not to bury historically expensive notes but rather to highlight, intensify, and produce new affects through the sum total.

Fragrance and flavor wheels were developed to schematize, visually represent, and make aromatic classification consistent. They are a visual materialization of the trans-subjective production of industry; they create a taxonomy for systematizing odor and the experience of it. [lxviii] Within it, each material/note is differentiated and defined by two distinct yet also relational features: its olfactory volatility and, therefore, compositional utility as top, middle, and bottom notes in a blend based on the volatility of compounds and its partition into floral, spice, animalic, etc. categories based on natural historical differentiations. Both taxonomies are also shaped by extraction mechanisms (distillation, enfleurage, solvent extraction, and so on). These segmentations define matter by olfactive properties based on performance qualities in a blend and historical biological natures, again dependent on aromatic difference.

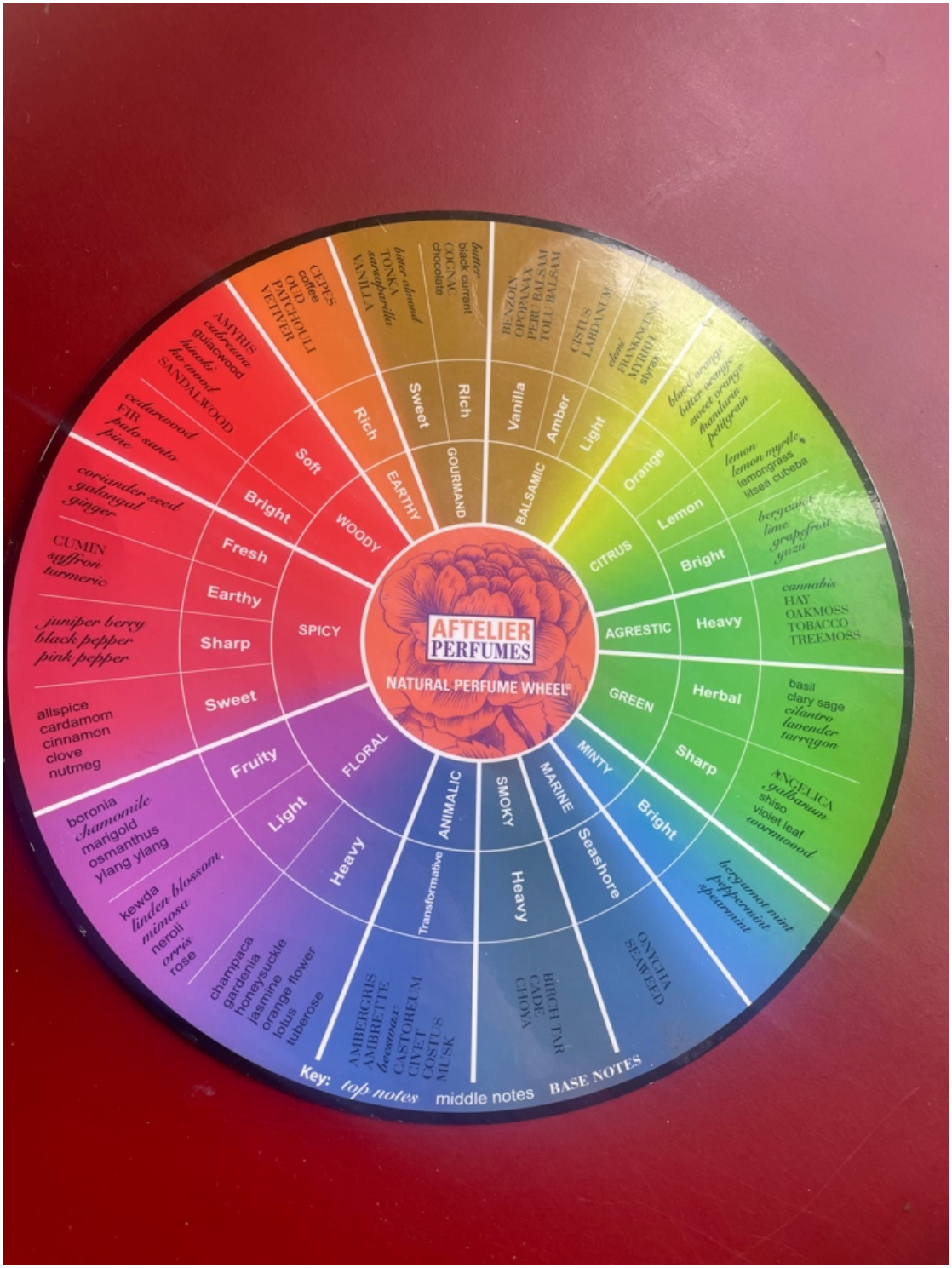
In the wheel, perfume materials taxonomies emerge explicitly as a relation to one another as they are placed side-by-side and in diametric oppositions. Placements systematize relative and interactive properties and stabilize the identity of the matter through these features. It is meaningful that units are placed on a circle and also in color; the spectrum is what, in practice, articulates materials in their relational likeness as possible substitutes in a blend. Their relations as opposites, too, give that flexibility as the accord structures are barebones suggestions for filling in according to dynamism in a blend. I break it down further:

In perfumery, the longevity or endurance of materials expressed first through temporal performance on a blotter is central to the theory of formulation. The classification system of Top, Middle, and Bottom notes provides the basis for conceiving a material-relational role in composition both laterally and vertically (what is the scent competing and combining with versus what is the sequencing and overlay). This TMB designation thus informs how one trains to identify an ingredient (when/where you search for it or know to find it in a composition with your nose) and shapes the ways one studies or builds with the materials as a relational practice. Olfactory duration relative to other ingredients and the materiality of evaporation shaped by the extraction process comes to define ambergris as a bottom note—slow in its vertical expression in a blend and enduring due to its resinous weight distributed in alcohol distillation.

In the fragrance wheel, sensorial attributes are classified into seven general categories following traditional perfume composition paradigms called *accords* that were detailed initially by French perfumers like Fargeon and Houbigant, and routinized by perfumers producing at larger scales, like Piver. These traditional characteristic categories include Citrus (fresh), Floral (femme), Fougere (nature/green), Wood (masc.), Chypre (balsam), Amber (Oriental/soft), and Leather (animal, tobacco). These seven categories represent the kingdom-level differences, articulating the divisions that scaffold perfume composition identities alongside discrete component parts.

I read these accords not only as a set of historical olfactory trends and preferences memorialized in recipe suggestions but also as codifications respondent to the excesses of a particular moment of French imperialism, played out by perfumers like Houbigant and Fargeon. Accords are thus scaffolds for compositional play and they organize relations between ingredient parts; and they are also archives of previous material conditions as resources available and the

trends/preferences they condition. In the continuity of perfume formulation, accords are also continuously productive as they absorb new materials and meanings in contemporary practice.



Aftelier Natural Perfume Wheel ©

Articulating Ambergris as an Accord

> Ambreine is the pure warm, rich aroma of honeyed amber. It would be hard to think of a perfume that would not be enhanced by the inclusion of this base note and it is especially welcome in gourmand or oriental perfumes. Ambreine comes from further processing of labdanum resinoid from the cistus plants in Andalusia. This old proprietary process is only carried out by one company in the world, similar to producing an absolute but with a different solvent.
>
> -*Aftelier,* Natural Perfume Website

Accords, an olfactory classification paradigm at the blend level, create a scaffolding for both designing and describing a perfume, though they do not fully characterize it. The accord names a set of olfactory affects and suggests a historical structure for composition. As such, they help organize the ways in which a single note relates to another; they provide organizing principles for thinking about the role and perceiving the identity of each essence. Accord formulations also offer a central mechanism by which fragrance units—again identified through performative aspects of participation in a blend, relations of likeness and difference—translate from naturals to synthetics.[lxix] They also offer a way to think of the multiplicity of expression of a single unit, like ambergris, as a composite of many other ingredients whose assemblage describes or interprets an aspect of the material. Accords thus create a condition for the flexible participation of components.

Ambergris can be made as an accord, either as an interpretation of the amber accord family, focused on a resinous, deep, and spicy mixture surrounding labdanum, or assembled by other ingredients that enact aspects of its profile: leathery, smokey, minerally, saline, honied, fecal. Both emerge from attuned discernment of smell in olfactory description, units together of a total composition. To move from a structural principle level of understanding of the olfactory classification of ambergris as part of an amber family into a sensory experience of ambergris as a function of its olfactory relation to resinous groupings, I took an *amber accords* focused class and an ambergris accord class to understand the space between a theory of formulation that correlates a broad general set of olfactory affects to the ingredient combinations that can produce them, and a practice of formulation that tries to reproduce a specific material through experimentation with its unique qualities as an interpretative sum of more subtle and unitary characteristic affects.

Amber can refer to many different things: sometimes a perfume accord as was the outline and creative prompt for the class; sometimes it's a material, one anchoring both genesis and departure for the imagination of an accord, often focusing on labdanum;[lxx] sometimes it's a fragrance family circumscribing a whole set of olfactory relations; and sometimes it names a fossilized resin which is not the same as that used in perfumery.

The stated purpose of the amber class was to learn to smell the "amber DNA"—the basic building blocks of an amber composition. DNA provides a relational metaphor for positioning the fewest characteristics required to create accord or family in perfumery. The DNA is a simplification, offering a scaffolding proposal for an interpretative build-out in nuanced detail. Amber is a flexible accord in terms of composition and membership as a family; its broad architecture is defined by soft and warm resins anchored by labdanum, vanilla, and benzoin. The perfumer who taught this course stated that *to achieve an amber accord, one can mix those three*

in almost any proportion, and the result will still yield a version of it. This activity of general suggestion is one way an accord articulates a theory of formulation as a flexible sum of constituent parts, as relations rather than a rigid and singular group identity. The act of composition requires attunement to the ways in which the aggregate, as an expression of parts combining, dances together, and merges.

In terms of fragrance family, the broad-spectrum accord includes woody, musky, and powdery notes. The accord is sweet, but unlike *gourmand,* which became a popular fragrance family in the 2000s, it is less edible and has a little more pungency and funk. It is *sweet and boozy, fruity, a little smokey and leathery owing to the labdanum facets—but the sweet things don't come together as sweet as you might expect*. For this class, we smelled the ingredients: labdanum, vanilla, and benzoin in and as the DNA to attune to their unique qualities and complementarities.[lxxi]

Having smelled the DNA of amber, I inquired about the teacher's interpretation of it in relation to ambergris. The response characterized ambergris by the common *oceanic* and *mammalian* aspects, stating that the width of the accord was roomy enough, by design, to encompass the spaces between that olfactory range. I was told Ambergris *contains a huge spectrum; it has everything from animal, fecal, tar-y odor, to very sweet honey hay notes, to a spicey peppery quality*. *As a matter of fact,* she quipped, *whenever you are looking at classifications, it tends to be highly subjective*: *what was taught to me by teachers sometimes doesn't make sense to me, so I change it*; *there are different ways of classifying materials, and it is fundamentally a way of organizing yourself.* Apropos the entire thesis, the meaning of scent is mobile and made actively through practice. Perfume compositional practice centralizes and embraces the act of material-discursive generation, as we can see in another compositional practice of assembling ambergris as an ambergris accord.

ONLINE

Fri. Jan. 29 – Ambergris Accords

on Zoom

In the latest of her accords classes, Ashley leads a thorough study of the ambergris accord. This online session will focus on helping students understand the molecular components of the various facets and types of the material, leading to a greater adeptness at blending, and well-trained noses. By attending this class, an emerging perfumer or scent artist will expand their capabilities and training, gain the materials knowledge to add oud accords to their arsenal, and leave with a deeper understanding of the artistry and science behind perfumery.

Please note that this class is recommended to be taken in combination with Dana El Masri's Genealogy of Scent: Ambers, Resins, Balsamic, Part 1 on January 14th and Ambers, Resins, Balsamic, Part 2 on January 28th.

The identity of ambergris is defined by its olfactory proximities to ambers, resins, and balsamic notes conferred through by the well-trained nose; its essence is parsed equally by component parts as by how these are enacted in practical, blended relation.

The *Aftelier* website quoted at the beginning of the section identifies ambrein, the chemical isolation of the olfactorily active component of ambergris, squarely in a perfume taxonomic cosmology: amber. It is a member of the amber accord and resinous family for its expression as a dense, honeyed aroma. Its spice qualities orient it as a possible participant in the paradigmatic blend families oriental and gourmand. Ambreine becomes the elocution for the olfactorily active aspect of ambergris, opening the door for the whale relation into the amber field and its similitude to balsam and resin—a whole field of analogy.

An ambergris accord is circumscribed by its inclusion in an animalic palette that shares a large Venn overlap with the amber families. Functionally, animal notes are not considered central DNA components but rather enact more performative affects: animal notes make the whole of a composition *shimmer.* In a course I took at the Institute for Art and Olfaction in Los Angeles focused on an ambergris accord, one statement about it was repeated: *a micro-dose has a profound effect, but you can't smell it; a significant dose impacts the entire blend and emphasizes contrast within.* While it affects the overall composition, some theories of formulation might not include animalics in a formula's budget as they affect the entire column of the fragrance rather than providing a discrete modification to discrete ingredients therein. When counted, animalics are formalized as base notes for the weight, a function of their fattiness expressed through both aerated and sedimentary durability in a blend. Understanding these textural and temporal qualities is fundamental to what ambergris does in a blend and is definitional to that which it has been made.

The IAO course provided an explicit layout of the DNA of an ambergris accord, again, the essential components or facets of the aroma of ambergris. The *DNA*, Ashley, the perfumer-teacher for the course told us, *does not capture the details but gets at the fundaments of the smell.* This is what perfumers do: they make the essence of a thing, name its component parts, and in their expertise, confirm it as truth in nature. The DNA, listed in the chart below, provides a skeleton and framework for creativity and design within an established referential framework. Through the accord framework, Ashley's ambergris DNA outlines ambergris as a flexible composite of 18 materials. An accord in this day in age is, as Ashely's above is, generally always already a proprietary object. The ingredients, by the accord framework, offer flexible participation of component parts. This 2021 rendering of ambergris includes 8/18 synthetic ingredient participants in the mix, and the practice of composition—formulation, sniffing, titration—assimilates each into the ambergris accord DNA.[lxxii]

Ambergris Accord

MATERIAL	DILUTION	DNA	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	FINAL
AMBROX DL	10%	30	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
ISO E SUPER	10%		10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
[redacted]	10%	10		10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
[redacted]	10%				2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
MUSCENONE	10%	6				10	10	10	10	10	10	10	10	10	10	10	10	10	10
[redacted]	10%						4	4	4	4	4	4	4	4	4	4	4	4	4
AMBRINOL	10%	10						10	10	10	10	10	10	10	10	10	10	10	10
INDOLENE	10%								4	4	4	4	4	4	4	4	4	4	4
[redacted]	1%									2	2	2	2	2	2	2	2	2	2
CASTOREUM ABS 50	1%										3	3	3	3	3	3	3	3	3
[redacted]	1%	1										1	1	1	1	1	1	1	1
COUMARINE	1%												1	1	1	1	1	1	1
BEESWAX ABS	1%													2	2	2	2	2	2
HAY ABS	1%	3													3	3	3	3	3
CLARY SAGE EO	1%															1	1	1	1
[redacted]	1%	2															2	2	2
BLACK PEPPPER EO	10%	2																2	2
DILUENT		36																	13
TOTAL		100																	100

INSTRUCTIONS:

Prepare dilutions of each material to be smelled separately (note dilution % column).
Then prepare trials 1 through 16, and final. In class, we will smell each material separately and then the blends.

THESE FORMULAS BELONG TO ASHLEY EDEN KESSLER AT STUDIO SENTIR, AND ARE SHARED FOR EDUCATIONAL PURPOSES ONLY.
THEY ARE NOT FOR PUBLIC DISTRIBUTION.

This *Ambergris Accord* has redacted to maintain anonymous composition in regard of its proprietary nature while still evidencing the notion of essence as a sum of various possibilities of formulation.

Each ingredient in the ambergris accord has been sniffed out and assembled therein through olfactory identification on a spectrum of amber qualities and organized by their volatility otherwise as top, middle, and bottom notes. Ambergris receives a new nature, a DNA of composition through the confirmed introduction of Ambrox DL, Iso E Super, Evernyl, Muscenone, Habanolide, Ambrinol, Indolene, Coumarine, Adoxal, and the dilutant. The mix both refreshes the authority of the mix while also evolving its nature—new intensities, interpretations, processing mechanisms, durations and material capacities, chemical ontological principles, lexicons, and environmental criteria from toxin load, cheapness, and aspects of environmental sustainability are all carried into ambergris. The nature of smell is opened and settled again in tiny moments of sniffing.

The goal of the course was to learn, through inhaled attunement, to identify the essence and assess amongst a panoply of characteristic details. Ambergris becomes amber and ambreine alike through the *body's learning to be affected by hitherto unregistrable differences through the mediation of an artificially made setup,* whether the natural perfume sniffing and composition course or, as will be explored further in the following chapter, in the fragrance corporation laboratory. (Latour 2004, 4)

Even under abstraction for mechanized human reproduction, the meaning of ambergris depends on embodied logic. Molecular detection and corroboration activities depend on bodily expertise and qualifications of arousal. Learning to smell, as with student odor kits like the one for the Animalics course at IAO (pictured above), creates relations and relativity through material pairing, sniffing, and classificatory designations. In this purview, chemicals articulate a body (a subject), a world (objects), and language together, just as ambergris did on the boat and in the court—a dynamic sensorial becoming. The compositional practice of perfumery orients chemical world-making capacities through breath and as breath.

Bruno Latour elaborates on the word *articulation* to discuss the non-bifurcated ways in which materials become differentiated through the learning-to-be-affected of the body (2004). Articulation is an activity of detection and corroboration of unitary isolations dependent on corroboration from a coextensive body, on precise identifications and qualifications of arousal. In acts of *articulation*, a body, a world, and language are mutually activated, parsing categorical relations, bodily relations, and the conditions of material encounters conterminously. In this history, odor kits with their selected materials in bottles, the classroom space with the expert at the front attaching lexicon to shared individual moments with designated pipettes, the formulae in their grouping and ratios, the bowing towards the composition in a sniffing together, all articulate ambergris according to such designations. Perfumers are ventriloquists for nature; they speak for it and shape it in form, making and remaking the object ambergris into something natural, and defining what that is according to what they can do with it.

This chapter articulates two things at once: a material history of technology the bolstered the rise of the perfume industry, as well as a semiotic history of meaning-making in within it. These features not only depend on each other, but together are the condition of possibility of the emergence of the perfume form. The material technological advances in solvents *and* the symbolic/semiotic standardization of sensory experience transformed aromatic practice in the 19th century and constituted modern olfaction in material-discursive industrial palette.

Chapter 4

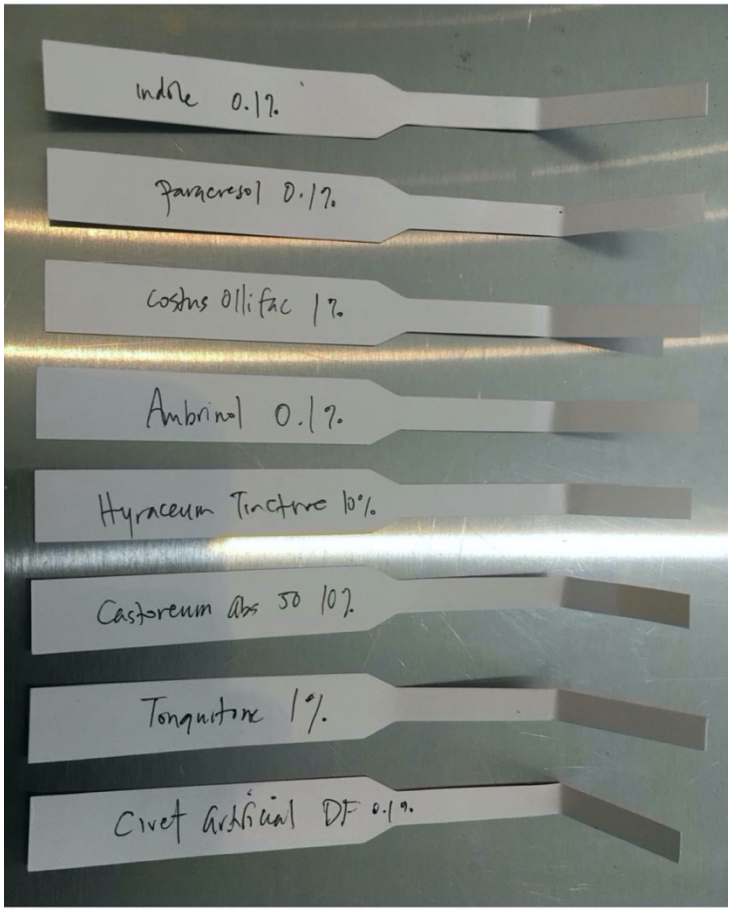
Chemical Space

Whale Deracinated
The Ambivalence of Chemistry
Physter Catodon by Any Other Name
Chemical Space & the Big Boys' Production
Scent in the Age of Mechanical Reproduction

Whale Deracinated

In this chapter, I track a set of scientific histories and institutional orientations that condition the possibility for ambergris to be recreated as a set of chemical essences. I trace a brief history of the emergence of chemistry in experiments between mineral and olfactory forms and explore the contemporary institutional structures, industrial frameworks, and laboratory practices by which chemical forms are articulated and naturalized. Amongst these histories and situations, the entity called Ambroxan is assembled by Clary sage, E. coli, and petroleum, remaking ambergris anew as an essential composite of networked entities whose collective olfactory performances approach historical ambergris taxonomic aromatic assignments.

I follow the work of the nose in confirming this material shift, in its particular productivity, not only in corroborating the effectiveness of chemical fungibility but also in generating a new surplus of chemical possibility through olfactory attunement to the shapes, bonds, and torques of the proposed essential forms. With the discovery of *chirality*, molecules came to be known not only by their structure but as a directional shape, the rotation of which activates differential affects in the body.



Ambergris Accord:
In continuity with the perfume classroom, practices of sniffing in corporate laboratory spaces confirm chemistry as a mechanism of worldly reproduction and replacement, ingredients of which are generated industrially under corporate design for how they perform in blends as controllable, proprietary ingredients for perfumery.

Through the contemporary activity of the fragrance industry, the whale, its oceanic wildness, and entrenched bio-geographic material relations become a mobile configuration of newly selected parts enacted by chemist-perfumers in labs. Ambergris is summoned from its preciousness,

liberated from an oceanic milieu, and produced anew, a honed scientific version of taste that is simultaneously over-coded and totally reduced. The whale is excised and rebuilt in relation to capitalism, imperialism, pandemics, class, and the transition from one oil economy to another.

Chemical essences, olfactory and otherwise, seem to exist above the times and spaces of their making. And yet, they are exactly produced through situated economic, scientific-institutional and corporeal conditions. In fact, and in material, chemicals themselves embody the geographical exigencies of their formation. In practice, worldly reproduction through chemical synthesis depends on the nose to corroborate equivalence beyond structural and graphic renderings of compositional similitude. The successful merging of diversified olfactory affects with materials (like ambergris and its petrochemical reproduction, Ambroxan) depends on an industrially choreographed cross-fade of technological generativity, proprietary articulation, public narration—all conferred through sniffing. The rendering of the molecule form depends on the embodied mediation of forms learned to be felt in spaces that appear to be acontextual, non-biogeographic in a laboratorial milieu of technological isolation.

The Ambivalence of Chemistry

In the 20th century, chemical structure started to define the very essential mechanisms of life, becoming a fundamental means for and mode of mechanizing nature (Bensaude-Vincent 1996). That century can aptly be characterized by a dramatic material reorientation concerning the essential life and nature of all things as industrial production, particularly industrial fragrance production, confirmed the trans-epochal struggle of chemistry to locate the fundament of matter in molecular forms. The evolving quest to locate the *espirit recteur* of things (the 'guiding spirit' responsible for fragrance named by Plato and Aristotle) congealed anew in the study of the spatial arrangement of constituent atoms. The identification of structural principals in all things, mineral, animal, and botanical, established a blueprint for scientifically understanding all life matter and for reproducing it as a manageable facsimile.

As a material language—in graphs, in two and three-dimensional models, in an arcane lexicon, in a set of robust financial institutions—chemistry sets up a direct relationship between a particular set of structural relations (molecular bonds, the patented socio-technical ecosystems for rendering these) and the material space of possibility in a laboratory (see section entitled *Chemical Space*, ahead). Importantly, qualities of molecular behavior upon which the field pivots are shaped by deep institutional and social contestations, sometimes petty, sometimes class-based, and always by economic imperatives, especially those suturing the relationship between minerals and plants, coal tar and botanicals.

In *Elixir: A Parisian Perfume House and the Quest for the Secret of Life,* Teresa Levitt traces the legacy of the French perfume industry in giving form to the field of synthetic chemistry. (2023) The book opens with the experiments of Édouard Laugier (1807–1869), heir to a Grasse-originating family perfume business, who used the family perfume shop on rue Bourg-l'Abbé in Paris as a formative site for synthetic olfactory investigation.[lxxiii] We follow some of his experimentations which, in the thrust of the book, are most notable for bringing chemist Auguste

Laurent, who first proposed theories of molecular substructure in organic chemistry, into a perfume laboratory space.

Laurent experimented with indigo, opium, cinchona, tobacco, bitter almonds (unnoted in this account as specific materializations of colonial exploitation), and finally coal tar. 1842**,** Laurent distilled coal tar to 'produce its own kind of spirit,' ascertaining the organization of its molecules in crystalline form through the distillation procedures of the day. In the evaluation of the crystalline structure, he found it analogous to one resulting from bitter almonds that Laugier had been working on, bridging the divide between coal and living things, and suggesting the transmutation of one into the other (Levitt 166).[lxxiv] Laurent proposed that the vital essence of matter, mineral and vegetal alike, lay in the position of each composite element in relation to one another like pieces on chess board— at a time where the majority of chemists strove to isolate each, as though separate from the board, in groupings of constituent atoms.

The crystalline visualization made a link beyond Natural Historical classificatory groupings, beyond life and inanimate matter, beyond the mineral and the biological. Critically, the structural equivalence was validated not merely as structure, but by the likeness of smell. That first forging of *structural, olfactory* equivalence established the presiding mechanism for modelling an industrial science in which elements which behaved the same in a relational structure could be swapped out by other matter—each element of which also gained identity through correlation by likeness. He proposed a new rational method of organic classification based on the functional groups present in the molecule that became the basis of the Geneva nomenclature for organic chemistry adopted in 1892.

On the distinctive role of the nose in both corroborating the world fungibility project of chemistry that bloomed in the wake of Laurent's coal tar distillation —as well pointing beyond the field's limits—Levitt writes:

> But what, exactly was the nose capturing that all other chemical tests could not? The strange case of caraway and spearmint deepened the mystery. Caraway seeds have an utterly distinctive scent, deep and spicy, giving rye bread its particular flavor. Spearmint has an entirely different odor palette: fresh, sweet and light. Yet as chemists were able to isolate the parts of these plants, they found two substances shared what seemed to be the exact same factory responsible for their odor. Chemically identical in every way, they could be distinguished only by smell and a curious fact of polarization: oil drawn from caraway rotated polarized light to the right, and oil drawn from spearmint rotated light to the left. Was there information carried in smell that could not be captured by the chemical formula? It bore resemblance to the spirit recteur, an invisible, effable factor that governed the human experience of scent." (174)

The profusion of experimentation around chemical reproduction through structural similitude, what I call fungibility, yielded a new insight: variation in a structure's 'optical activity,' that is its rotary capacity (turning to the right, to the left) in the third dimension, determines the binding capacity and performance of the structure. Structural asymmetries propose a clear distinction between naturally occurring and the human-chemically rendered forms: natural products possess a singular fundamental rotation path that synthetically produced ones do not. In other words, "Nature is one-handed; the laboratory is ambi-dexeterous." (Gordin 2023) Louis Pasteur is centrally credited with this discovery (following a heavy scientific influence from Laurent, though he scrubbed his dissertation from any mention of him)—an entire historical episteme regime shift assembled in the image of one man.[lxxv]

Importantly, this difference registers specifically in and as embodied affects. The chemical difference was most clearly evidenced in smell. Previously an antagonist to Laurent, the French chemist Jean-Baptiste Biot commented on the sensorial-rotary condition with what might, perhaps, be the most elucidating insight concerning the sense of smell as a historic, material relation that is articulated, that in turn articulates subjects and objects together. He commented on how such structural asymmetry "affected how these substances acted upon the human body. Smell was often the first, most immediate form of action on the body…" (Levitt 174) A chemical structure's *chirality* (as the directional torque came to be known) is not simply a structural nuance but also is constituted by its relational impact upon a human body.

A central condition for petrochemical fungibility is thus precisely the same condition of possibility for learning to identify and be affected by olfaction. That the body is a singular, extraordinarily well-tuned device that can distinguish between mirror-image molecules is arguably the most interesting 'discovery' in Levitt's book.

In 1847, the early organic German chemist August Hofmann created the first patent for *Nitrobenzene*, the almond scent forged in coal tar. In 1855, he named the class of compounds that came with six carbons and fewer hydrogens, "aromatics," solidifying the group as the key to the chemistry of scent, and establishing a sturdy scientific platform on which to found a practice of perfumery in coal tar synthesis. He is quoted saying, "this perfume may now be procured from coal tar in tons, if required, with the greatest facility and at a trifling cost," (Levitt 178) forever changing the nature of perfume composition and the definitional identities of its ingredients. And this new definitional matter, *a apropos* the quote above, simultaneously remakes the human body, its pulses and registers parsing new articulations through the extant categories and their historical affects.

The research laboratory soon became an unmatched frontier for the previously imperial accumulative functions, creating new pathways of material identification, extraction, and assimilation towards a new naturalized, capital-sensory order. Chemical olfactory production, by the exact practice of structural isolation first, and then fungibility as productive likeness, is also always then making arguments about the essential nature of the smell in question as part of the creation of the material.

Heliotropin, for example, a synthetic floral fragrance known for dancing in the space between vanilla and cherry pie, was first produced in 1869 through the deconstruction of black pepper. Through contemporary techniques of splicing, the pepper revealed a structural and olfactory resemblance to the delicate powdery scent of the flower. It was soon synthesized with regularity in perfumery to add vanilla or almond nuances to blends, and in the composition the Heliotropin/black pepper relation came to characterize general spicy, balsamic aspects in synthetic perfumery (balsam etc. is not a general characteristic of the Heliotrope flower). From the new kinship with black pepper, new possible sites of synthesis were identified; today, heliotropin is isolated from dill, vanilla, and violet in addition to black pepper. *Vanillin*, also in the powdery-spicy olfactive family, was isolated in 1874 through tests on Spruce tree resin and another resinous by-product, guaiacol. Its smokey note can now be "prepared through various routes in the laboratory," sorting these new turpenic, petro-forms into traditional accord families.

(Gilman and Blatt 1941) The production of vanillin reduced costs of use for that scent note so significantly that it was employed by mainstream perfumery, debuting as the dry down for *Jicky* by Guerlain in 1889, arguably the first petit bourgeois perfume.[lxxvi] It all but replaced vanilla.

The "real turn of the tide" for synthetics in perfumery occurred in 1880 when Houbigant,[lxxvii] one of the oldest and "most powerful" perfume houses began to experiment with them. (Levitt 220) The creation of *Fougeres Royale* used the powdery white vanilla affect of coumarin as a base upon which were layered synthetic green notes, redolent of freshly mown hay, and then a natural floral bouquet of rose, geranium and lilac, then Bergamot and chamomile. *Fougeres Royale*, with a successful public assimilation of synthetic notes, gave a new mossy, lush genre (Fougere) to perfumery. Fougere, and the accord structure more generally, provide a formula for analogy and replacement by chemical compound (see Chapter : *The Nose that Composes*). The public celebration of *Fougeres Royale* mobilized synthetics from their association with cheap replacements, creating a value for evocations and aromatic profiles that did not yet exist, opening another new frontier for the expansion of this socially diversifying luxury object.[lxxviii]

Physter Catadon by Any Other Name

> One thing is important that must be said in our epoch of rationalism and pragmatism: Ambrox, although unique and fantastic, is not amber gris and will never be. When in Zanzibar, the Maldives Islands, Aden, Al Mukhalla, the island of Socotra, the wild places where giant turtles are in sight, amber gris is available. When I smell the natural product, I feel shame and pity for our epoch. Amber gris is a wonder, but Ambrox, so widely used as the alternative, does not have the charm of the real thing, although many people want us to believe the contrary.
> -Arcadi Boix Camps, *Perfumery Techniques in* Evolution

The epistemic shifts in the field of chemistry that I traced above allowed for the social uptake and re-valuation of synthetic scents. Ambergris, the anchoring substance in this study, was also caught up in and remade by these development. Flashing forward to 1946, Leopold Ruzicka, a Croatian biochemist working for Chuit & Naef Company in Switzerland (est. 1895, becomes Firmenich in 1934), isolated *ambrein*e, a triterpene alcohol—a class of six connected volatile organic compounds in the structure of three units. To date, ambreine remains chemically essentialized as the chief active olfactory constituent of ambergris. Ruzicka had won a Nobel Prize in 1939 for his work on 'higher terpenes,' including the first chemical synthesis of male hormones, which followed his previous research on pyrethrum, the crude extract of *Chrysanthemum,* for insecticide, which brought him squarely into a study of fragrant oils in the perfume industry. He then discovered the structure of *muscone* and *civetone*, derivations of deer musk and civet, two of the four animal fats (ambergris is another) used in early perfumery, between 1918-23.

In 1950, Max Stoll discovered that he could convert *sclareol* from clary sage into a molecule with an intense amber-like aroma--the characteristic accord within which ambergris, as a perfume ingredient, is nestled. Shortly after earning his doctorate under Ruzicka, he became a researcher at the manufacturing facilities of Chuit & Naef, then director of its research group from 1927 onwards, finally becoming head of its scientific department between 1934-1967. At Firmenich Flavor and Fragrance, one of the largest and most competitive fragrance manufacturers in the world, Stoll patented the sclareol design Ambrox,™ one of the 60 he would produce over his time there. Following its previous epochal confirmation as bezoar or bitumen, in the intestinal tract of the Sperm whale, that same affective matter became a spatialized, corporate-proprietary, affective form by its triterpenoid shape and the amber-y similitude it induced.

With this designation, the new clade of olfactory experts, chemists, started to articulate ambergris as a function of ambreine ratios and their carbon triplet forms:

Ambergris essentially consists of the triterpene alcohol ambreine, together with a series of sterols of the cholestanol type. (Janistyn 1941; Lederer 1949)

The ratio of the two groups of terpenes apparently determines the quality of the material. Thus, the best samples contain up to 80% of ambreine, while black amber is found to contain 46% of the sterol derivatives. (Korzh and Strigina 1972, Rowland et al. 2018).[lxxix]

Linking biological scarcity to an inducement to chemically reproduce ambergris, Charles Sell, author of *The Fundamentals of Fragrance Chemistry*, an industry standard perfume chemistry book, writes,

> Ambergris has always been very expensive and the decline of the whale population exacerbated the situation. The price and availability of the natural material essentially preclude its use in fragrance and a lot of work has been done on synthetic substitutes. The naphthofuran is prepared from sclareol, a diterpenoid found in clary sage. Clary sage oil is used in perfumery and sclareol is extracted from the distillation residues.

In an economically ontologized episteme, it is no surprise that a foundational chemical-olfactive document concerning the remaking of ambergris within the terms of a unitized, reproducible, rationalized world contextualizes said molecule not only in chemical terms, but also positions those terms specifically as conditions of cost and availability. In a matter of three sentences, Sell attaches an economic exigency to the reproduction of the olfactory matter ambergris—a teleological necessity in/as chemistry. The arcane chemical designations (naphthofuran, sclareol) follow seamlessly in this logic as well as a set of self-evident processes for en situ controlled production. The form is now in obvious facticity in essential kinship with salvia. The section offers another procedural technique, the oxidative degradation of lactone *sclareolide*, for yielding a further ambergris derivation, and magically, to the distanced reader, two distinct biological gen, kingdoms really, plant and animal, *mammifera* and *Magnoliopsida/dicotyledon* [lxxx] become forged anew as essential siblings.

In the ambergris project, chemistry defines and substantiates nature as a kind of rationality that assays the world through the ordering of atoms and the command of their reactions, wielding power in the simultaneous co-production of things and knowledge about them. The materiality of models becomes the privileged mode of access to epistemic things, delimiting molecular

attributes and performance through physicals properties of their own right. In economically inflected, molecular composition, oceanic and solar processes become linked to self-evident graphic truths alongside dense polysyllabic diphthongs. Various olfactory qualities are parsed in and out of the molecule form. These renderings map affective possibilities: briny; ozonic; earthy; smokey—each essence makes ambergris and Ambrox together, designed for their controllable reproduction, mass activation in industrial use, and of course, proprietary accumulation.

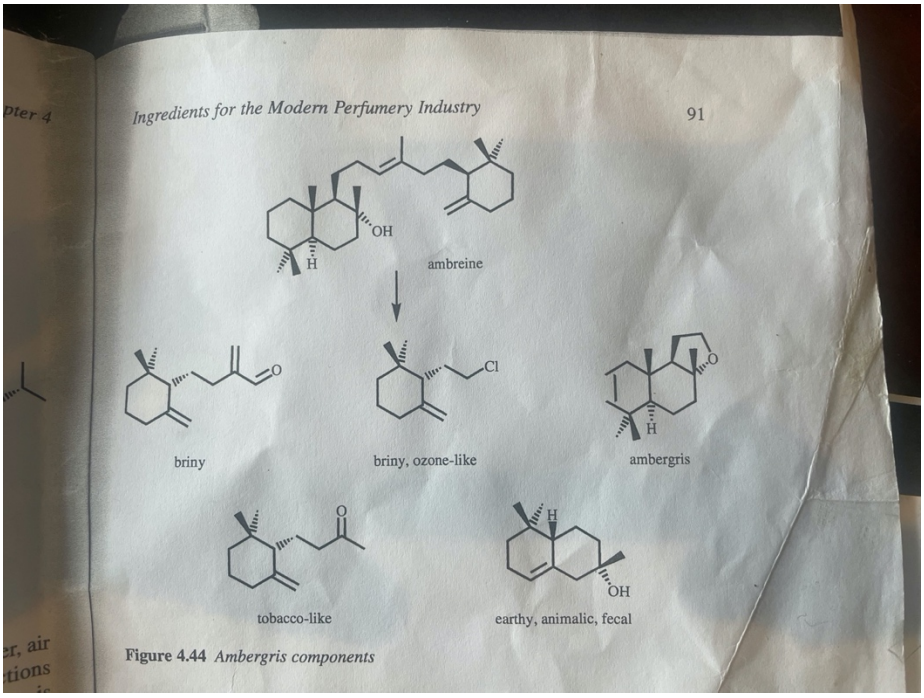


Figure 4.44 *Ambergris components*

The chemical structure of ambergris breaks it down as a composite of smaller, isolated units bound by corresponding, unitized olfactory qualities. These articulations splice along historical locations of the amber accord in perfumery, and as informed by the ambergris milieu.

The chemical breakdowns are understood as constitutive and interchangeable features that also interpolate a wide range of macroforms into a new world molecular order.

Each of the shared aromatic groupings has a chemical rationale. As a synthetic vernacular, it is articulated as shape, as a set of bonds and their relative fixed strengths, as the sites and conditions of their breaking. Earthy-fecal becomes attributed to the presence of alpha-ambrinol and alpha- ambrinol epoxide, nomenclature derived in reference to differential, heavily oxidated processes. Tobacco notes come from dihydro gamma-ionone; the marine metallic from homocyclogeranyl chloride and gamma-homocyclogeraniol. The algal component comes from amber aldehyde or *ambraldehyde.*[lxxxi] In the laboratory space, something incredibly contextual and complex has been remade into a chemically definable and taxonomically fixed molecular designation.

Importantly, and like the amber accord discussed in the previous chapter, these designations depend on the creation and activity of composites, of composition[lxxxii] In *Perfumery: Practices and Principles,* author Stephen J. Jellinek comments on the critical role of composition, that is smell and production via smell, in sedimenting such chemical world-making proposals (Calkin 1994) . He writes,

> If we look further into the chemical make-up of fragrances produced by flowers, taking rose as a typical example, we find that the oil is usually made up of perhaps no more than four or five materials that represent that main bulk of the product, with frequently hundreds of other materials making up the balance…If we mix together in the laboratory only those materials that make up the bulk of the product, although smelling of

> rose, the composition has little of the true character, strength or aesthetic appeal of the flower itself. It is the combination of all the other materials, mostly in trace amounts, that results in the fragrance that is uniquely rose. (81)

While this section emphasizes how chemical processes rationalize the complex assemblage of chemical material, sensory experience, and social meaning that is ambergris, reducing it to something repeatable and fungible in the age of organic chemistry, I include this quote to suggest a limit to such totalization. In commodity, molecular and olfactory production, there is always surplus and overflow. As aesthetic processes, *plus* to a chemical processes (French for more), chemical rationalization does not replace the exact social function of the smell of a rose. For a nose like Jellinek's, attuned to rose like that of rose damascene or Bulgarian rose, synthetic production of four or five materials that represent the "main bulk of the product," is different, and does not present the "true character" of the rose. This suggests that older modes of perceiving, identifying, and valuing 'ambergris' persist alongside its chemical reproducibility. And yet, a multi-billion dollar industry thrives upon the proposition that equivalence is achieved. I am not arguing that sameness is achieved; I am showing, in a sense, how it is generated. The rest of this section, then, is oriented to explore the ways in which it is achieved—as a function of utility, wherein, ambergris is defined by operational behavior and useful qualities.

Through the process of *chemicalization*—the movement of industrially produced chemicals into commodity production (Romero, 2017)—molecules become richer in informational content and come to exist not just as physical elements but also as databases and referents for other molecules, as well as legal embodiments of commercial patents and processes. From Andrew Barry (2005), then, I carry forward the concept of 'chemical space' as a way to name properties of molecular relation with other different molecules, referring specifically to both differences in molecular structure and to molecular territories owned and circulated by particular firms.

Chemical Space & the Big Boys' Production

One can smell from miles out the American fragrance, flavor and salty-snack production facilities of Firmenich in Princeton, NJ. The train glides with its cinematic light and landscape, but the smell, it grows faint to heavy, and suddenly, you're enveloped within a pervasive olfactory atmosphere that affects all things. The palpability of such intensive spatial conditioning by a commodity fabrication campus is an experiential surprise.[lxxxiii]

The Firmenich flavor, fragrance and salty snacks campus is taciturn for the visitor. Several mostly unmarked institutional buildings portend discrete and knowing flows. The buildings of the multi-billion dollar business flaunt almost no insignia, and their broad spacing communicates only difference in operation.

Video camera, sliding doors, atrium, receptionist greeting, and I was inside. On the wall myriad fragrance products were suspended, proclaiming corporate success in a variety of domains: hand soaps, dish soaps, detergents, room sprays, candles, lotions—a cache of household space and quotidian use. I was given a badge and accompanied upstairs in an elevator to visit a perfumer there, SV.

SV's office was through a series of code access doors on the right of a broad hallway designed for maximal air flow. The outfacing walls of all the offices in the row were glass; I passed a perfumer with a graphic model open on a computer screen, sniffing a test strip, contemplating. Bookshelves lined both the inner walls of SVs office, and one was filled with more domestic cleanliness products displaying the company's, and SV's, olfactory-financial success in client bids fulfilled. My eyes got caught on a vibrant purple iris graphic laid upon a seafoam frothing cucumber laminating a plastic push-top hand soap. *Calone* reverberated from my IAO class *was invented in the 1980's as the closest approximation to an oceanic note that molecular engineers have achieved; it is used for cucumber and melon aromas in an American market that prefers fruity notes.* The everyday objects were polyglot and layered with history.

The Firmenich fragrance division is structured around market types: fine fragrance, focusing on 'prestige' personal perfumes; body care and hygiene, focusing on personal wash, soaps, gels, deodorants; and fabrics and homecare, detergent, dish wash and so on. On the right SV's computer was alert, organized to send formulas to the titration machine and lab hand across the hall or to the large-scale production machine downstairs. A pile of manila folders hosted client briefs soliciting fragrance styles and narrative evocation for future materialization. The table extended in an L shape to parallel me, sprouting sundry blotters and sample bottles.

Fragrance houses, like Firmenich, generate formulas for both raw materials and perfumes for products ranging from detergents, household soaps, candles (their three biggest mainstream clients, in order) to fine fragrances for the perfume industry. Along with Givaudan, International Flavor and Fragrance (IFF), and Takasago, there are seven major smell and taste corporations, the so-called the 'big boys,' the top three of which (including Firmenich) endow the scent features of virtually every scented commodity today (Burr 2002). Each house functions by the careful digestion of and response to client briefs (companies like PG and Dial) requesting fragrance compounds for their external circulations.

Perfumers in this case either reside in-house as with high-end fashion brands, are hired externally on a case basis, or hire fragrance production and distribution companies, like Firmenich, to design a profile. SV's work as a perfumer is to translate both the soliciting company and Firmenich's abstract financial goals into an olfactory match (olfactory molecular economics) synched to the evocation-narrative of the company's brand.

For the fragrance design, SV generally vies for the commission internally through the creation of a range of prototypes, some original and sometimes drawing from unused blends from previous projects. Several perfumers from the same lab may compete for the brief, and all formulas developed are property of Firmenich. Practically speaking, SV writes a formula and sends it through the computer to the lab where it is composed by a giant mixing machine dealing in droplets. Each ingredient has its own tube and nozzle with titration selection capacity programmed in respect to formulaic principles already designated and/or specified by the perfumer. Vats of proprietary molecules, both Firmenich's and external firms', sit hosed and ready beneath the machine, awaiting direction. The technician is at hand in case a paste needs to be heated for mixing or added in discrete/sensitive quantities due to expense or volatility. A conveyer belt moves a bottle along positioning itself under each dispenser. This mechanized perfumer's organ is often as big as the room, and the room is built to house it.

SV explains that chemists tend to internalize the three-dimensional organic chemistry models of their training into mental maps. On paper, chemical shapes can be read up and down, and left and right; on the computer and in the mind, the spaces between molecules and the bonds themselves operate in a third dimension. The shapes are visualized and employed for the functional group that determines their characteristics—largely known by the distances between bonds. *It is important to understand the components because parts are mobile and in movement,* not locked in a certain complex, which affects the smell. *Shape is the key*, and the ability to simultaneously see it graphically, in 3-D, and as an olfactory impression constitutes fragrance creative praxis.

Natural and synthetic raw materials are produced on site (this is the America production HQ) and distributed in quantities varying from 1 kg to several tonnes. Some raw ingredients come in liquid form, others arrive as pastes, and some as powders /crystal-like forms. Everything is transferred to storage containers labelled with unique barcodes, which are then indexed and stored according to their particular integrity needs. Each barcode includes a lot number, proprietorial indication, date of production, arrival and the factory, expiry dates, and any special warnings for handling. Liquids are decanted into steel tanks and generally kept around 55 degrees, with nitrogen added to fill up otherwise oxygenating space; pastes are stored in cold rooms; powder and crystals stay at room temperature.

At several thousand liters, a perfume is always produced according to the same method: the concentrate, or blend of materials which make the formula, is mixed first; then the concentrate is diluted. Before a fragrance is weighed out, each barcode is scanned for traceability in every bottle. After mixing, concentrations are stored in vats for maturation for some days or weeks. They are kept cool to ensure no sparks while other chemical interactions play out through the different raw materials. When brands hire Firmenich to make a composition, they generally commission the concentrate for production in the factory; the client brands then often carry out the dilution separately in their own bottles and alcohols in house or via subcontractor.

SV and I tour the facilities. Down the hall (there are posters boasting the new fragrance terminology *nature identical* fragrances; samples accompany them and smell like something else). In one R&D room, I see two men in lab coats bending over what look like copy machines, sniffing at the exhaust slats. On a floor below, we pass small closets with a window on the door: "throw" test rooms to evaluate the radial reach of candle fragrances. We pass through rows of lab stations, where I see two other technicians holding beakers and thrashing to Led Zeppelin. At the end of the hall, M, a molecular engineer, shows me an enormous machine that encapsulates detergent aromatics in different sized plastic spheres, designed to burst to release aroma at different timescales of endurance, enabling textiles to smell fresh and refreshed for a number of weeks.

We pass a final technician who offers me a chance to sniff prototypes for a new molecule patent, a non-nature referent aroma. The fragrance is a new interpretation of a previous Firmenich patent that has just debuted into free circulation from its 20-year moratorium as a 'captive molecule,' a designation constraining its application and formulation to in-house use for that duration**.** *Cascalone*, for example, a modified version of Calone, was released by Firmenich in 2020. Firmenich has molecular research centers in Geneva, Switzerland and in Grasse, which both

work on finding the next new captives. My head is full as I leave the facilities that day, of a panoply of old and new aromas, and of the new consciousness for various structures, technical and social, that render them to circuit and condition daily life.

Scent in the Age of Mechanical Reproduction

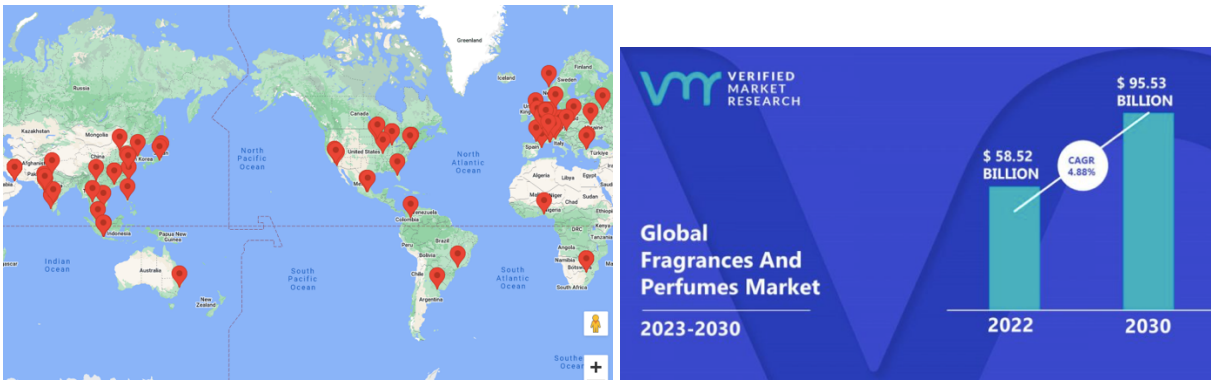
> Odors, a particular class for perfumes, are feelings evoked by the action of odorous molecules on a specialized sensor whose entry consists of receiving molecules carried by sensory cells of the olfactory mucous membranes. The attributes traditionally recognized by olfactory reaction are quality, intensity, and the emotional tonality or hedonic valence. The olfactory system is able to discriminate a very great number of different qualities, be they corporal odors or mixed with them. The intensity is the subjective force of the sensation. A function of the concentration of molecules which come to the olfactory organ per unit of time, i.e., molecule flow. The balance corresponds to the dimension of pleasure or displeasure which accompanies the smell. More unstable than quality, it depends at the same time on the experience of who perceives it.
>
> -André Holley, *Perfumes and Olfactory Research the Stakes for Tomorrow*

Firmenich Flavor and Fragrance is one of the largest and most productive sense manufacturing corporations in the world. They hold over 16,000 patents for original fragrance and flavor molecules,[lxxxiv] including three of the most employed ambergris reproductions *Ambroxan* (1940), Cetalox/Amber DL (1988) and AMBROX ® SUPER. They have been known to produce up to 30 new molecule patents a year, with the profit of some CHF 4.9 billion in sales in 2022.

At Firmenich, the ambergris odor family—Ambroxan, Amberlyn, Ambrox DL, and Ambrox Super—constitutes one of the most expensive terpenoids to both produce and purchase starting at €15/gram, with volumes produced ranging between 10-20 tonnes/year. In an industry where dilution rates for the intensity of such products start at .1% and cap at a 10% rate maximum, with similarly cautious ratios in an overall blend, the seemingly small tonnage represents an enormous potential when blended and aerated. .When bought in bulk directly from the corporation, the products go for some €500/kg., providing potent substitutes for various amber, saline, or wood dry olfactory dimensions in perfume compositions.

The knowledge of molecules in and as spatial arrangements has its legacy in a complex social political laboratorial space—between institutions, patterns of accumulated material, and political alliances. As functions of industrial processes and social relations, Ambroxan is ambergris rearticulated as a set of proprietary designations that encode the laboratorial-economic conditions of their findings. Discrete contemporary institutional conditions shape which molecules are used and how, and thereby how and what smells are introduced into the world. Ambermor® (IFF), Ambroxide® Cryst® (Symrise), Ambrofix® (Givaudan) Cetalor® (IFF), Ambrotech® (Cao Chemicals), Ambermor EX® (IFF), and Orcanox® (Mane) offer ambrein interpretations based on distinct technologies belonging to their attendant corporations, chemical splicing and analysis programs and specific technical experimentations in generating captive molecules—technical programs that manipulate intensities, molecular weight, performative function, and therefore fragrance profiles are also proprietary and differ across corporations. (Francoeur 1997) These ambergris interpretations emerge through competition over ambreine qualities mediated by price, institutional know-how and molecular captivity status. Firmenich's ambergris creations are most

widely used, and, in the classes I have taken, heralded for their proximity to the verité in both olfactory complexity and their function in a blend.



Firmenich has production facilities production facilities in 83 locations worldwide. The projected increase in production promises to condition the air in more totalizing circumference.

The *untainted whale*, the designed molecule subtending ambergris, is estimated to be present in some 30% of fragrances released since the 1990's – at highest concentration at 13% in *Bois d'Argent* for Christian Dior in (2007), in Guerlain's *Mitsouko*, a *Chypre* launched in 1919, *Eau des Merveilles* by Hermes, Dioressence, Creed's Angelique, and Juliette Has a Gun Not a Perfume (which is not a perfume but rather Ambroxan mixed with perfumer's alcohol sold at…€120 for a 100ml bottle).

The subjective intensities and market formulations designed to ride and spike feelings of pleasure and indulgence--the corporate rationing of such intensities, are startling in their breezy crosshatched articulation by perfumer-chemist Andre Holley. This section opens with this brazen olfactory scene: science making scent on the seemingly natural and broadly agreed-upon terms of cellular membranes. Yet, Holley's words treat the biological and emotional aspects of smell both separately from the global corporate economic scientific conditions of its making and together at once. Holley sutures bio-physical truisms with the subjectivity of pleasure in a startling gesture towards the latter's systematization, that is, its economic production in the perfume industry at ever cheaper, mechanized and analogous articulations. The graphic articulation of ambergris discussed across this chapter allows us to think about the relations between material forces and social forces of capital accumulation.

In these pages, I tracked the conditions by which the molecular composite Ambroxan becomes employed and essentialized as the modern form of ambergris. A corporate institutional and scientific philosophical entity, Ambroxan is materialized in graphic, linguistic, and compositional laboratory practices that depend on attunement to embodied affects in order to corroborate its capital-motivated epistemologies. In the making of synthetic, fungible chemicals, the nose is marshalled anew to assimilate the materials of a contemporary political economy into previous epistemological classificatory models; the rendering of the molecule form then depends on the embodied mediation of forms learned to be felt in spaces that appear to be acontextual, non-biogeographic laboratorial milieux of technological isolation. And yet, as on the ship, these manifestations are actually rife with historical, situated contexts.

Conclusion: On Chiral-Affection

> Memory is the horizon of sensory experiences, storing and restoring the experience of each sensory dimension in another, as well as dispersing and finding sensory records outside the body in a surround of entangling objects and places. Memory and the senses are co-mingled in so far as they are equally involuntary experiences. Their involuntary dimension points to their encompassment by a trans-individual social and somatic landscape.
> -Nadia Seremetakis, *The Senses Still*

In my training as a perfumer, the world reveals its blossoming as geographical difference all around me. It is June, and jasmine still catches me in its frank white shrill, a Persian endowment that no doubt brought itself here through its narcotic olfactory affect. I also get caught in detergent plumes, whose intensities seem to be on the rise; *Spiroglabanone*™ (patented by Givaudan in 2003) pierces my breath and floating consciousness, situating me instantly in a political present.

The chemo-molecular critique I have started to develop above, changes the space around me, quite literally. With detergent's conditioning, the political life of my breath, of the many codes of spatial signaling are less naturalized; the jasmine requires a longer memory. In scent, history is there whether I know the story or not, and my trained attunement to it changes what I mean by or perceive as 'place' as well as the way I think about, perceive the depth of relations assembled at every moment. Today, spatial politics is also molecular, corporate molecular, and the human body is *renewed as part of the existential, pedagogical and ethical grounds of cultures of science* (Masco 2004).

The sense is replete, and as a process of articulation, also underdetermined.

The magnetism of ambergris to the perfume bottle was spurred in mid-nineteenth century dissection and extractive labor, partitioned by rights to the lay and the domestic exigencies of a growing colony. It was impelled to a Euro-sense scape by craft perfume houses worldly titration; evaluative categories concerned with its brine and fade, appraisers clandestine, its transmutation capacities in early solvent grain, its temporalities in distillation & co-maceration are constituted in social relations. Ambergris is directed forth by combustive technologies ship lab and on land, borne through global circuitry and by FedEx, steered by merchants for market pulses, each imparting upon its values. Thermohaline nutrient and squid spawn, the timelessness of gyres and doldrum, the great beast's metabolic rhythm and the all the reveries imagining it 'out there' and down under: these each have been marshalled, massaged too into a liberal moral code of scarcity, then taken up by burgeoning fashion houses winking new capital frontiers and corporate.

Sloterdijk responds, "bodies become differently-attuned, differently enveloped and differently-air conditioned" (2009, 99) by way of mundane chemicals and the atmospheres they animate. In this utterance, Sloterdijk refers to the material, theoretical and experiential inheritance of air, in his case focused by aerations of war and terror.

After all of this, one can say: the erasure of whale in its specific physicality is not an erasure of the whale in its social form. In the molecular essence regime that produces Ambroxan, labors of boatswain labor are replaced by graphic and technical exertion in the lab. An embodied practice of classification and trained conferral reconfigures industrial material ecologies and whale

intestinal anomalies are replaced by deep terrestrial digestions. The coin-faces of extractive regimes and taxonomic reasoning are preserved in the rendering of likeness, that slowly, from one place to another, are operationalized and abstracted. The episto-politics of a whaling economy is replaced by the onto-generativity of chemical corporation.

Insofar as the compositional assemblage of body, mind, and things in the laboratory formalize molecules as scientific objects, the effects of molecular presences are much more volatile and indeterminate outside the lab. Tim Choy's engagement with air as heuristic capable of encompassing the vagueness of atmospheric politics and the many, concurrent experiences of it-replete with parallel, sometimes incompatible units of analysis, methods of sensing," (2012, 4) calls for more sensitive attention to the interactions between air and bodies for the ways in which breathing reflects the dialectics of air and capital, *"orienting us as breathers"* (Choy) and rendering us as "pupil[s] of the air." (Sloterdijk 2009, 84).

Another way to say this then could be that *systems endure*, extractive and accumulation orientations too, and these beyond metaphors of solidity. Material affects are in ancient evolution, whether squid-spawn or fossil-fuel, and their reverberation depends on the durability of host bodies components *and* the semiotic codes into which they are trained. The sense-ecology of every 'now' is always itself an individually complete and overflowing milieu, pieces of which are availed again for new assemblage. The stories concerning how whales become molecules is also then about what escapes or over-flows from rationalization in historical reference, in nutrient upwelling, in the turning of spade and windlass, in the dance of monarchs, and their beheadings, in ritual acts of power, terraformation, in distillation and titration. Those historic reverberations, even in partial recognition, also exactly create the possibility of new sensory experience. Both/and, the senses assimilate with some path dependence and are creational at once.

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Endnotes

[i]Ackerman quotes Abram Maslow, an American psychologist that discusses the human in the language of inherent traits: "if a man's only tool is a key, he will imagine every problem to be a lock;" (14) an inclusion that possibly broadens her descriptions to critique the limitations of presiding metaphors in enabling nuanced understandings. The lock-and-key metaphor is itself a product of a mechanistic, Enlightenment thinking that attempts to control 'nature' while producing it, in effect encoding the broadness of possibility in a (seemingly apolitical) corralled human imaginary.

[ii] This compositional understanding of time, perhaps, provides an aperture for thinking and perceiving the ways in which scent is said to be transportive or time-transecting, a colloquial insight, but one to flag for future geographical consideration in the nuanced elaboration of space-time compression.

[iii] In recent years, scholarship on affect has offered new perspectives on the imbricated, political relationship between sensation and the environment, and the ways in which power inflects these (Stewart 2011; Chen 2012; Anderson 2009; Shapiro 2015). This move effectively complicates many dualisms so central to geographic critique: subject/object, nature/culture, human/milieu, inside/outside. Amongst many useful considerations of affect, Sarah Ahmed's articulation of the tack-iness of affect, the connective function, the ways it articulates "what sticks, or what sustains or preserves the connection between ideas, values and objects," (Gregg and Seigworth 2010, 29) is critical to that which I explore in the enduring and evolving natures of ambergris at large.

[iv] Where any one 'note,' tuberose or lavender, may be called an essence (as in *essential oil)*, the presence of a material in a space of compositions is always already the product of several processes of isolation that actually at each level are supported by many kinds of partnerships or activities in concert. Examples include: nomenclature like "species"; the segregation of the plant as a unit; the plant part selected (flower, root, leaf, sap, gland); extraction method.

[v] Shout out to De la Cadena 2015; Myers 2015; Cruikshank 2014; Jackson 2011; Chen 2007, to start.

[vi] In the late 18th century, the two imperial practices of mapping and classification generated a foundational logic for industrial production. The often visual-methodological investments produced specific worlds whose geographic, racial, and gendered hierarchies have not only constructed a powerfully limited universal understanding of time and history (Chakrabarty, 2000), they also continue to frame most analyses in the academy today, constraining the ways in which knowledge is produced and queered. In the generation of taxonomic systems, discrete animal and plant characteristics are isolated from a larger habit and milieu, and the processes by which they were rendered such disappear so that such delimitation appears as naturally essential. (See Freedberg 2002; Burnett 2007, Schiebinger 1993, for example).

[vii] While I am not particularly interested in reifying or overtly postulating Modernity as a location or historical population, many of its definitive fantasies (scientific rationalism, class & taste civilization) are expressed through explicit exercises of power that fit snuggly with the characteristic episteme of early industrial capitalism exercised in the American Whaling Industry.

[viii] The quote comes from "Private Property and Communism," an aspirational essay that underscores the regime of private property ownership as the substrate of all social relations under capitalism and argues for the emancipation of the human organ through communal reorientation. Marx's version of historical subjectivity is engendered through and by material relations. In Marxist theorization, human labor is reified by its appearance and valuation in object form; labor time/experience are transmuted into an exchange value, a relation that appears to exist naturally, without history, between objects. In the process of objectifying labor and mediating human relations through object values, the individual human organ becomes a social organ. Under capitalism, the relationship of private property persists as a relationship of owner power in a world of laborers and materials. The utility and perception of consumption (as well as the insistence on more production) are mediated by a drive towards the reproduction of capital, constituted partially and together by the laborers themselves and the objects they both produce and consume. The relative value of an object amongst others is shaped by relative social power structures, instilled in the object by price and notions of taste. These values shape a human material ontology (my diction, not Marx's), affecting language, knowledge, consciousness, and experience at even organismic scales (think of medical practice at large to make it explicit). The human organ becomes a social organ.
In this way, sensing matter and sensory matter itself engender worlds. I am interested in exploring the enduring legacy of such relations in the creation and perception of matter, as a matter of political commitment to the human organism.

[ix] Whaling memoirs are a rich source for arriving closer to an accurate imagination of life in 19th century whaling work. Many accounts written as personal journals by whalemen of varying nationalities and educational formations presence myriad intimate, historical observations. For example, see Beane, *From Forecastle to Cabin*; Bill, *Citizen*; Browne, *Etchings of a Whaling Cruise*; Bullen, *Cruise of the Cachalot*; Camp, *Life and Adventures of a New England Boy*; Crapo, *Strange, but True*; Davis, *Nimrod of the Sea*; Haley, *Whale Hunt*; Hazen*, Five Years before the Mast*; Jones, *Life and Adventure*; Osborn, *Reminiscences*; Paddack, *Life on the Ocean*; Sampson, *Three Times around the World*; Taylor, *Life on a Whaler*; Whitecar, *Four Years Aboard the Whaleship*; Williams, *One Whaling Family*.

[x] See Shoemacker 2015.

[xi] A photograph startles one into a relational glimpse that eclipses more than it makes knowable. One might say this: the ocean has always been a Black space. But beyond taught wind, tidal rhythmics and a telescopic orientation, no assumption about qualities of tone or teamwork on deck can be made. How do they speak to each other, and what do they say? Do they search in silence? What is the feeling of the sound of that forever water on wood?

Divisions and experiences of labor at sea certainly differ from those on land. First-hand accounts offer the most granularity in regards to the character of race on the ship (see endnote vi), yet Ashley's *Harper's* story, from which this photograph comes, does not elaborate on racial experience, his white experience or otherwise. Of the 34 crew members aboard this bark, *Sunbeam,* 21 were from Cape Verde. Where a study of Black bodied life in whaling is the beyond the scope of the present text, I consider those present in the photograph here through the following texts that enumerated a variety of references concerning Black bodied seafarers in the 19th century.

Before the twentieth century, maritime trades offered the broadest opportunities for employment, and in New England there were proportionally more Black men working alongside Whites than any other industry. Estimates on the number of Africans and African Americans working as boatsteerers, seamen, cooks, stewards, blacksmiths, coopers and greenhands on board whaling vessels vary. In a survey of protection papers for New Bedford between 1809-1865, Martha Putney located the names of 3,189 American-born Black sailors who participated in ocean voyages. (See Putney 1972)

Research on the role of Black seafarers at this time is often built out of historic records in maritime museums, libraries and historical societies in New England that employ a range of physical description. The Kendall Whaling Museum has developed a monograph entitled *African Americans in the Maritime Trades: A Guide to Resources in New England*, which provides an integral reference and bibliography on the regional repositories of documents, photos, art, artifacts, as well as citations concerning Black peoples, almost always men, in early American sea trade.

After 1796, each American sailor was required to carry a Seaman's Protection Certificate for identification and proof of citizenship, information of which was collected at every port and included physical descriptions and biographical data. In both Massachusetts and New York, a separate form was used for Black sailors following Congressional neglect/consistent non-ambivalence about who the state was for; ambiguous information on these cards can be interpreted alongside conflicting geographical freedoms at this time. For information on crew lists and protection certifications, check out Martha S. Putney's book, *Black Sailors: Afro-American Merchant Seamen and Whalemen Prior to the Civil War.* James Abajian's three-volume *Black in Selected Newspapers, Censuses and other Sources; and Index to Names and Subjects* is also useful. For personal narratives that wield important information about race on the ship deck at the time. W. Jeffrey Bolster's article, "To Feel Like a Man: Black Seamen in the Northern Sates, 1800-1860," clarifies the centrality of Black mariners in the region's economic and maritime history." "Coloured Seamen," in the 1846 *National Anti-Slavery Standard*, addresses discrimination straight on (Foner and Lewis).

Alexander Starbuck's *History of the American Whale Fishery from its Earliest Inception in the year 1876* lists returns of whaling vessels to American port each year, as well as returns in oil and bone. *Whaling Masters* compiled by the Federal Writers Project of the WPA lists known whaleship captains and their commands. Reginald B. Hegarty's *Returns of Whaling Vessels Sailing from American Ports* carries Starbuck's list forward from 1877 to 1927, and *The Whalemen's Shipping List and Merchants' Transcript* (New Bedford trade Newspaper) lists the names of almost every whaler in the US.

Finally, E. Berkeley Tomkins's 1972 article, "Black Ahab," chronicles the life of William T. Shorey, the first apparent Black captain as the whaling industry moved to the Pacific coast.

[xii] In *Agential Realism: How Material Discursive Practices Matter*, Barad parses the productive and relational nature of the phenomena. They amend the prefix in the notion of *inter*-activity (where *inter*- posits a relation amongst or amidst preexisting bodies that remain independent) to *intra*-activity to emphasize that distinct agencies, human and otherwise, do not precede but rather emerge through their relation. Phenomena, for Barad, are ontologically inseparable from the entanglement of intra-acting 'agencies.' It is through specific agential intra-actions that the boundaries and properties of the components of phenomena become determinate and that particular concepts, i.e., material articulations of the world, become meaningful. Phenomena in this iteration are considered ontologically primitive, and it is the specific intra-actions within phenomena that give separation to observable object and apparatus of observation.

In Barad's scope, apparatuses define the material conditions of possibility of matter/ what matters; "they enact what matters and what is excluded from mattering." Apparatuses "enact agential cuts that produce determinate boundaries and properties of "entities" within phenomena (148) Apparatuses thus create and materialize relations and embody theories about what and how the world is. They are, in a sense, "practices of knowing in being," in other words, situated knowledges (Haraway 1988).

In this configuration, the mutual boundaries of phenomena are variable since they are enacted by the specifics of an experimental practice. As boundary making practices, they produce subject and object in terms of a changing relationality. Following this logic, I underscore that ambergris, as it is rendered through the American whaling industry, comes into being anew. Without denying the facts of its physical existence in the world, the specificity of its determinate properties is made according to the exigencies of the moment and embodied in the tools, practice and language of the whaler. In this theory of variable and derivative formation, subjects too emerge part and parcel to the ontological contingency. It is exactly in this way, in the ontological contingency, in the material relation, the mutuality of subject and object, that I mean that the senses are historical.

[xiii] In 1835 Beale published a 58-page booklet with a long title: *A Few Observations on the Natural History of the Sperm Whale, with an account of the Rise and Progress of the Fishery, and of the Modes of Pursuing, Killing and "Cutting In" that Animal*

with a List of its Favourite Places of Resort (London, Effingham Wilson, 1835). The apparent success of publication led Beale to revise it into the more substantial: The Natural History of the Sperm Whale: its Anatomy and Physiology – Food – Spermaceti – Ambergris – Rise and progress of the Fishery – Chase and Capture – "Cutting In" and "Trying Out" – Description of the Ships, Boats, Men, and with an Account of its Favourite Places of Resort. To which is added, a sketch of a South-Sea Whaling Voyage; Embracing a Description of the Extent, as well as the Adventures and Accidents that Occurred During the Voyage in which the Author was Personally Engaged. (London, John van Voorst, 1839) which was published in 1839.

[xiv] Scoresby was an English whaler, scientist and clergyman; heir to his father's wealth accumulated from the Arctic whale fishery; his father also innovated upon the barrel crow's nest—the elevated lookout points on the ship's mast. Scoresby researched ice, crystals, ocean science, and magnetism and wrote a book in 1820 on The Northern Whale-Fishery.

[xv] In contrast to Cuvier's method, for which a single fragment of bone provided an almost certain way of knowing the whole of the animal, Ishmael allows the immensity and undecipherability of the critter itself to contaminate his text. When he chooses to introduce the whale "in an archaeological, fossiliferous, and antediluvian point of view," he deliberately selects ostentatious and pompous adjectives (497): "Applied to any other creature than the Leviathan—to an ant or a flea—such portly terms might justly be deemed unwarrantably grandiloquent. The whale, whose superlative magnitude demands that he be treated in an "imperial folio" and described with the "weightiest words of the dictionary," thus silently shapes the volume set out to contain it. If his "fully invested body" tends to vanish under the scalpel of modern science, the animal impresses itself into the figure of the novel to which it bequeaths his name.

[xvi] Buckland developed the first full account of a fossilized dinosaur (1824), which he called 'Megalosaurus,' giant lizard. His geological research at Kirkdale Cave in Yorkshire proved that it had been an antediluvian hyena den, rather than the remains of animals from the time of Noah's flood. A whole dissertation could (and must somewhere already) be written about this moment. It was praised as an example of how scientific analysis could reconstruct distant events.

[xvii] There is a significant body of humanistic science that explores the political circumstances that condition fields of scientificity, the objects these engender and recreate, and the universal theoretical positions confirmed therein. Scholars have noted how visualization techniques, like those enacted by microscopes, telescopes, and cameras, are effective apparatuses for both producing scientific truths and the means to produce them (Freeberg 2002; Shapin and Schaffer 1985), as well as producing scientific subjects capable of reproducing practices of differentiation (Crary 1990; Daston and Gallison 2007). Others, like Schiebinger (1993), account for how taxonomic epistemologies are shaped and charged by social-symbolic differentiation already in play, an insight that helps understand how ambergris becomes culled into value by an industry that both rides on and peddles class and gender in object consumption forms (this insight is developed more in the next section, "World Class Palate.") From each of these, I take a cue for the ways in which they destabilize the seemingly self-evident and biologically contained parts of the whale, to really consider the conditions of their making.

[xviii] Darwin, Charles, 1809-1882. On the Origin of Species by Means of Natural Selection, or Preservation of Favoured Races in the Struggle for Life. London: John Murray, 1859.

[xix] In 1672 Robert Boyle writes, "ambergreese is not the scum or excrement of the whale, but issues out of the root of a tree, which tree, howsoever it stands on the land, awlaies shoots forth its roots towards the sea, seeking the warmth of it, thereby to deliver the fattest gum that comes out of it, which tree otherwise by its copious fatness mist be burnt and destroyed: wherever that fat gum is shot into the sea, it is so tough that it is not easily broken from the root, unless its own weight and the working of the warm sea doth it, and so it floats on the sea; there was found by a souldier 7/8ths of a pound, and by the chief two pieces, weight five pounds. If you plant the tress where the stream sets to the shore, then the stream will cast it up to great advantage!" March 1, 1672 in Batavia. *Phil. Trans., vol. viii. P6113*

[xx] I name the labor-less time loosely here after Geographer Nick Anderman, thesis forthcoming, 2024

[xxi] As late as 1853, the schooner *Armida* of Greenport sailed without try-works, making short voyages and bringing the blubber home for processing. The first record of try-works on ship is noted in the logbook of the *Betsey* of Dartmouth in 1762 (Daniel Ricketson, "History of New Bedford," 1858, 44). The September 3rd entry of that year notes simply, "knocked down try-works."

[xxii] Burnett characterizes five discrete but overlapping phases of commercial whaling, distinguishing each by stocks hunted and technologies applied, starting with the pursuit of Right whales near Western Europe from early ages through the twentieth century. The second phase concerns the one in question here, which he calls the 'southern fishery,' characterized partially by American ascendency as a global power. What he calls the southern fishery, of focus in this account, includes the pursuit of Right whales (*Eubalaena*) alongside the 'cosmopolitan' sperm (*Physeter macrocephalus)* (p. 10). He characterizes this phase as I do: involving the use of light, fast skiffs powered by oarsmen who carry the wielder of a hand harpoon as close to the whale as possible in the open sea. When successful, the harpooner affixed the skiff to the animal by a strong line bent to a toggle on the shaft of a harpoon, after which the boat retarded the fight of the injured whale, whose life was eventually finished by repeated thrusts from a long-handled lance. The whale's body was then cut in to as it bobbed lashed to the ship; long voyages into increasingly tropical conditions prompted the elaboration system for trying out the oil in rendering stoves placed amid ship (tryworks, described further in the next section), permitting casks of relatively stable liquid to be laid in the hold.

[xxiii] I take up the notion of population control in Chapter 2: *Object Affects*, in my discussion of miasma, the Plague and new hygiene management strategies by the state.

[xxiv] Burnett's thesis links early marine conservation science (documentation of migration patterns, gestation rates, mortality figures, food resources, and many other basic aspects of cetacean life) to industrial whaling; my dissertation tracks a similar historical progression of taxonomic science in relation to perceptions of raw material constraints, and the ways in which industrial demands prompt and digest scientific experimentation towards sustained/increased output--- specified towards the means and practices that articulate smell as a material relation.

[xxv] I refer to Chapters 32 Cetology; 67 & 68 Cutting In and The Blanket; 75-79 The Sperm Whale's Head- The Prairie; 91 & 92 The Pequod Meets the Rose Bud and Ambergris; 95 The Cassock; and 103 Measurement of the Whale's Skeleton specifically.

[xxvi] I follow Melville's observations and ask: how and in what ways does the forging of a sensory object engender a surplus of future objects, relationships, meanings, networks, and experiences—in short, condition the world anew? This dissertation follows that question through the material sensory productivity of the nose in worldly regeneration.

[xxvii] In *Delightes for Ladies to adorn their persons, tables, closets, and distillatories with beauties, banquets, perfumes and waters* (Plat 1608), ambergris appears casually and with repetition amongst recipe-proposals for all manner of domestic niceties: floral distillates, fruit gellies and ferments, medicinal syrups, meat preserves, washing balls, linen pouches, face powders and hair dyes, pimple and freckle treatments, hair dyes, sweat ablutions, pomanders and perfumes. The author, Sir Hugh Plat, was a man of class: a botanist and metallurgist interested in all things agriculture and mechanic; he wrote subsequent books stewarding land and supporting families in times of famine; he created formulae for cheap fuel; and even wrote a cookbook for sea-farers, the agents of social accumulation of the time (*Certaine philosophical preparations of foode and beverage for sea-men*. (Plat 1607) Whereas all of his works are united by an interest in technological invention, horticulture and domestic economy—making the production of life more logical—this book for Elizabethan households was one of the first of its kind. Bound by hand and stitched in leather, it materialized the ambits of taste, domestic skill and cosmetic practice for wealthy women in the performance of the class conditions of their time.

The nonchalant inclusion of ambergris as a possible aromatic flair for a gin cocktail or bespoke leather gloves makes a suggestion for the legibility of the ingredient amongst a literate class of people in the Kingdom around this time, those who also had sections of their homes equipped with distillation equipment, dedicated to fermentation and food preservation, who had gardens and tools, and who knew their way around each. The recipes within speak not only about the fact of the material presence and potential availability of ambergris at the time, but also the formulation of a sensorium: they delimit possible combinations and sequences, provide guidelines for ratios and intensities, and provide contour for appropriateness amongst sensory predilections. This early archive commences two centuries of recorded formulization of a Western European sensorial palette, assimilating ambergris into the domain of knowable flavor and fragrance.

Values therein were broadly built upon. In 1644, chocolate was used as a court medicine in Italy and England, and ambergris held high rank in combination. Cosimo III de' Medici's physician aromatized chocolate with ambergris, musk, jasmine, citron, and lemon peel; Henry Stubbe, doctor to Charles II, prescribed a mixture of chocolate containing 'the root of the male peony' mixed with human skull, ambergris and musk to help with 'hypochondriac melancholy' –a recipe attesting to ingredient permutation as part of a medical practice always already in flux in materiality. Robert Mays' seventeenth century cookbook, *The Accomplisht Cook,* designs many recipes that highlight the aromatic aspects of cooking, including a rose water formulation that steeps three potent animal ingredients, musk, civet and ambergris, together in a tea. (May 1660)

By the early 18th century, ambergris is already accounted for as *the dearest and most valuable commodity in France* (Aftel 2001, 27). The senses cannot be understood in isolation from their historical formation. In *The Raw and the Cooked*, Claude Levi-Strauss wrote that each sense "suggests other sensory coding systems" (Lévi-Strauss 1969, 153). The sense of smell, in these examples, is contiguous with foods, luxury items like chocolate gleaned from colonial aggressions in Mexico, contiguous with the books and moments of reading, of recipe and ratio formulation, with acts of cooking, and eating. Each articulation already suggests strong sensorial positions and historical orientations, carried forward from the extra-territorial accumulation position of the imperial whaler and/or from the fatigue-complacencies of kings and queens. Before it' formal use in perfumery, a multiplicity of formations already accrued densely in the object ambergris, figuring a suite of properties and values in sensory semantic activation.

[xxviii] In *Security, Territory, Population*, Foucault describes a key aspect of power as the structuring of conditions of space, particularly in the hierarchical and functional distribution of elements by the mechanisms of the state. Security, he writes, involves the identification and planning space in terms of events or series of events and possible elements: "the apparatuses of security work, fabricate, organize, and plan a milieu even before the notion was formed and isolated. The milieu, then, will be that in which circulation is carried out. The milieu is a set of natural givens—rivers, marshes, hills—and a set of artificial givens—an agglomeration of individuals, of houses, etcetera. The milieu is a certain number of combined, overall effects bearing on all who live in it." (Foucault 2009)

Foucault characterizes *milieu* by its appearance as a field of interventions at the level of the 'population,' which emerges at this time, defined loosely as a multiplicity of individuals who are and essentially exist biologically bound to the materiality within which they live. The concept of population is co-articulated with increasingly finer-tuned classification of the 'natural' environment and the events within that characterize them, and the state's authority to organize these forces, the fertility of the land, territory, commerce and population towards state power. The urbanization of territory thus becomes a key administrative concern. This aspect of power emerges in distinction from the interpolation of individuals as legal subjects (sovereignty) or as bodies capable of required performances (discipline). Security works through the milieu, and we see this bloom in the concept of miasma and approaches to it across subsequent centuries.

[xxix] The deliberation around the make up of air was inflected too by the changing role of scientists, intellectuals, and aristocrats in public life. Boyle's development of the experimental enterprise was consciously designed to give its practitioners political and

religious legitimacy and consolidate power during the Restoration. The Royal Society, of which he was part, portrayed early scientists as "modest priests of nature" removed from the religious enthusiasm deemed dangerous to the political project of the restoration. Boyle ostensibly fashioned a machine to manufacture facts-- as ministered correctly within the becoming-specified mores of an exclusive guild. In the process of articulating early chemistry, Boyle promoted a scientific-social order challenging to the perceived consolidation of power by the absolutist government at that time.

[xxx] From antiquity to the 19th century, the plague was regarded as a breakdown between the balance of elements in nature as between man and god, and linked to notions of corruption, death, decay and pestilence. Acron of Argigento tried to dispel the plague that ravaged Athens in the fifth century BCE by burning aromatic wood fires, following a belief that air (as specifically articulated by Hippocrates and disciples) influenced the constitution of all things. (Le Guérer 1992) Not unlike today, classical philosophy regarded space as a passive container, and air as homogenous, empty and inactive. The healthy and harmful aspects of the atmosphere were thought to be determined by elementary geographic, aerated qualities like moisture humidity, consistency, temperature. The basic premises inform contemporary forms of collective spatial anxiety, sharing some imaginaries with the germ form, many with the covid cloud, and in contemporary wastewater classification codes.

[xxxi] In *The Foul and the Fragrant: Odor and the French Social Imagination,* French historian Alain Corbin bares the capaciousness of smell as a medium of epistemic production concerned with nature and the environment in 18th and 19th century France. His detailing of smell as an episteme moves across ideas and practices concerning the body's susceptibility to disease; personal hygiene and domestic ritual; sexuality; city planning and the eventual privatization of water flow (drainage, sewage, bath & toilet); olfactory trends in fashion and perfumery; and the spatial organization of bodies, prisons, hospitals and boarding schools alike. As such, Corbin highlights smell as a historical perception that shapes the world in idea, practice, and matter alike.

[xxxii] Traditionally medical legislation and support was left to local communities, both secular and ecclesiastic with the growth of an absolutist state in France under Louis XIV. With the development of an increasingly centralized administration, certain health problems, especially the control of epidemics, had come to be a concern of the Comptroller General of Finances in Paris and of the representatives of the royal administration in the provinces. (Hannaway, 1972)

[xxxiii] The growing bureaucratized scientific arms of the government, including the Société Royale de Médecins, coordinated efforts to support and extend French colonization. The emerging practices of coding and evaluating airs according to the exigencies of health and hygiene normalized the spatial impositions of the state as a colonial mode of production, using the forces of knowledge to improve such production. (McClellan 2000)

[xxxiv] Early eudiometric experiments in open spaces provided weak and inconclusive analytical samples by the parameters of the time. Lavoisier obtained his first analytical results by collecting samples from closed spaces, controlled environments much like the modern laboratory. Alexander von Humboldt and Jospeh Louis Gay-Lussac used a eudiometer to detect decreases in oxygen content in relation to sickness and carbonic gas content, shifting a scientific method from a mostly sensory one into an early reliance on apparatus-extension.

[xxxv] There were many attempts to systematize a natural history of odors at the end of the 18th century: Condillac worked to create a language for translating perception into the meshes of science, in an attempt to create a language capable of translating the perceptions of smell "from animal origins to which it seems inextricably linked." (Corbin 1986, 111) Linnaeus' books formulated an early scientific ophresiology to understand scent in direct relation to disease as part of a broader physiology of the social order, and was followed by Cloquet in his *Ophresiologie ou traite des odeurs* in 1821, a book that Corbin writes about as an "enormous, sometimes excessive, and much-pillaged compilation [that] contained scientific discoveries, premonitory intuitions, and the most outrageous tittle-tattle side by side. (112) Fourcroy then stated that every type of odor was "solely produced by the simple solution of the odor corpuscule in air or in liquid," (Robiquet 1820)— a linkage of respiratory phenomena to early articulations of the combustive mechanism and the understanding of gas.

[xxxvi] State interventions in public hygiene and sanitation at this time attempted to take new responsibility over human life as a science, with a naturalized conglomeration of bodies in space as the unit of/site for management. Foucault writes that "the state's new function of responsibility for the population in its naturalness, the population as a collection of subjects [is] replaced by the population as a set of natural phenomena" (Foucault, 352). The state becomes concerned with not only maintaining an abundance of a number of men, but specifically with a conglomerate population as a relation with a set of natural/ naturalized forces identified: size of territory, nature as resource, commercial activities upon land, wages and so on (see ftnt xv with reference to swamp/milieu).

In S*ecurity, Territory, Population,* Foucault writes that the problem of contagion and epidemic disease is the problem of the town as the home of disease. The town is also the place of revolt, compounding as a "site of miasmas and death," that requires administrative rationalization of its inhabitants in terms of their work, health, wages, and the policing of their activities as subjects (2009, 61). These techniques attach pertinence to specific phenomena that are not exactly individual, but rather enact specific processes of individualization. The olfactory episteme is part of the production of the identification and characterization of *population* that requires cleanliness and scouring at individual bodily levels, and the curbing of contagion at environmental/urban scales. In contemporaneous scientific worldly elocution, Darwin posited that the element through which the milieu produces its effects on the organism is population; population is the medium between milieu and the organism. (McClellan and Regourd 2000)

[xxxvii] In Russia, atmospheric regulations of sickness translated literally into the same as a resistance to state suppression measure. The Cholera Riots of 1831 (Russia) united urban residents, peasants and soldiers together against tsarist quarantine and migration restrictions, variably aggressive and also not effective measures of which propagated similar, subsequent political unrest in England. See also Jabartī 1993. **8/11/23 8:20:00 AM**

[xxxviii] For more on the materiality of atmospherics see Tiffany 2000; Bennett 2001; Anderson and Wylie 2009.
[xxxix] Nigel Thrift describes commodities as 'magical technologies of public intimacy,' (290) for the ways in which they become invested by historical imagination, recalling historical scenes, collective associations, and feelings. These technologies work by allure: a hook into a personal story. Through the projection of glamor, objects carry the symbolic into a somatic-consumptive relation, into financial capital.
In this articulation, scent can be clarified as an active, intelligible force that communicates and engenders reaction. Perfume elaborates around popular psychology, riding allegories and archetypes with promises of individual supplement. Importantly, scent affects through forms of narrative intelligence that are not simply sensory and not merely discursive. I am exploring how narrative becomes constituted as a material, and how these charges operate over time (Thrift 2008)
[xl] Chandra Mukerji's book, *Territorial Ambitions and the Gardens of Versailles*, explains how the sensual extravagance of garden design in the time of Louis XIV in particular naturalized political territoriality. The practices of landscape modification--carving of canals, the arrangement of forests, boundary marking with monuments that rehearsed military tactics and elaborated new French aesthetic styles -- were key to the development of new state apparatuses of control and population assimilation. **A** further argument, and perhaps more germane to the central moves herein, is that the combined curation of garden and gatherings at Versailles cultivated an imaginative territory around splendor, luxury, and authority through which the king reigned supreme (Mukerji 1997). See also *Colonial Botany: Science, Commerce and Politics in the Early Modern World* particularly for the ways in which making equatorial plants live in France shaped early practices and notions of atmospheric science (L. L. Schiebinger and Swan 2005)

[xli]Antoinette was known for commissioning groundbreaking fashion: twice a week, dresses were created and presented to her by Rose Bertin, a name that became synonymous with the sartorial excess of the queen. Bertin's position as the designer of the queen secured her the position as the leading fashion designer of the French aristocracy and, subsequently, in European fashion. It is rumored Bertin's gowns each cost twenty times what a skilled worker of the time earned in a year.
Dresses and hair were Marie Antoinette's dorms of personal of expression, and Bertin clothed the queen from 1770 until her deposition in 1792. Marie Antoinette and her court also adopted the English fashion of dresses made of *indienne*, percale and muslin, materials banned in France from 1686 until 1759 to protect local French woolen and silk industries; this is one of many ways in which Antoinette's national loyalty was questioned. Bertin became a powerful figure at court, and she witnessed—and sometimes effected—profound changes in French society. Her large, ostentatious gowns ensured that their wearer occupied at least three times as much space as a male counterpart, thus making the woman a more imposing presence. Bertin's creations also established France symbolically as the center of the fashion industry, and materially in terms of textile circulation. She is in large part responsible for the worldwide reputation of French couture.

In the mid-18th century, the pouf, hair raised by pads and pomades, paired with the oversized luxurious gowns. Bertin created poufs for Marie Antoinette up to three feet high. The pouf became a period trademark, along with decorating the hair with ornaments and objects which showcased current events. Hair would be accessorized, stylized, cut into defining scenes, and modeled into shapes and objects—ranging from recent gossip to nativities to husbands' infidelities, to French naval vessels to the pouf *aux insurgents* in honor of the American Revolutionary War, which, in a confused political move given the internal financial crisis, the King had helped sponsor. The queen's most famous coif was the "inoculation" pouf that she wore to publicize her success in persuading the king to be vaccinated against smallpox.

Marie Antoinette also asked Bertin to dress dolls in the latest fashions as gifts for her sisters and her mother. The dolls called "Pandores" were made of wax over jointed wood armatures or porcelain and varied from small to half the size of a person. The dolls acted as couriers of fashion trends and communicated the modes in vogue until the appearance of Fashion magazines.

[xlii] Antonia brought to France with her what is narrated to be a very Austrian predilection for bathing as well as a refined toilet system, a mahogany *lieus a l'aglaise.* She took perfumed baths often and had moving water installed in her apartments, a whole set of rituals, garments and assistants for her various robes, powders, heating mechanisms, perfumes, soap ablutions. (Feydeau 2006, 49) At the time, most people bathed every 8 days-two weeks, most likely in the public baths.
[xliii] Despite the fall of the *ancien regime* and its "cour des parfums″ the houses of Houbigant and Fargeon, as well as Lubin and the rising Chiris (see Ch. 4: The Nose the Composes) perfume was rescuscitated in a new form and scale in large part due to Napoleon's recognition of the importance of perfumery to French manufacturing and France symbolic legacy regionally and globally. Napoleon helped rescucitate the traditional luxuries industry and granted imperial commissions towards scientific and technological research into organic chemsitry that would revolutionize the perfume industry in the last half of the century.
Once available to only the aristocacy, luxury products in the new empires has a more populuist culture and the availability of fragrances is evident in, for example, a Frenchman's tongue in cheek list of his wife'a annual expenses in 1807. It calculated: 600 dresses, 365 hats and bonnets, 500 pairs of stockings, and 200 francs worth of "essences, perfumes and other drugs to make her young and pretty.
[xliv] Of my favorite stories that I have collected across these research years, I read, without corroboration from the Osmotheque—the central ancient perfume reconstitution archive in France—that French Revolutionaries created their own fragrance by which to identify each other, invisibly, in presence. I love thinking of the silent collective recognition and vernacular, the subjective sense of knowing, silently, viscerally, whose company you keep, of knowing and categorizing affinities, without a word, not behind but in front of the very eyes of the police, however conceived. I searched Elisabeth de Feydeau's book, *A Scented Palace* for reference, and the closest, and close thing at that, I found, concerns the *muscadins*, the musk perfume middle class dandy mobs roving the streets in reaction against the Jacobins and sans-culottes (Feydeau 2006). Known for wearing tight coats, large

lapels, and elaborate cravats and sashes, the *muscadins* had a reputation as gilded youth, and the truth about musk aromatics or not, the scent symbol (perhaps a reference to the perfume court of Louis XV and certainly to luxury trade even if not signaling the animalic/street), reverberates constitutively with the name and character.

[xlv] The fragrance is today said to be 'feminine'—a conflation of women and flowers exaggerated in 19th century impressionism, evidenced too in perfumery as it started to articulate identity positions beyond class (Stott 1992). From the formula logged at *Osmotheque*, an archive for pre-industrial perfumes outside of Versailles, it has also been interpreted as powdery, and a bit waxy, as rose, whose essence would have been extracted through enfleurage at the time, carried a residual fat redolence. The white flowers, jasmine and orange flower, and bergamot, would have given vertical volume and depth to the composition.

[xlvi] As with all hand craft perfumes of this time, there was no metric system: the alcohol bases would vary by plant species, alcohol content, intensity, scent. Likewise, a rose harvest from bush to bush, plot to plot, month to month, had no stable aspect of repetition. Recipes were suggested outlines. And what is 'good' too in terms of balance, strength, pungency etc. has an evolving historical, geographical lexicon. Perfumers, thus students of and adapters of previous paradigms, develop interpretations that are also, necessarily, departures. The re-imagined scent features notes of orris, rose, jasmine, tuberose, lavender, violet, bergamot, orange blossom, cedarwood, sandalwood, Tonkin musk, ambergris, and oily galbanum.

[xlvii] The bourgeoisie, in its original sense is intimately linked to the existence of cities (and the development of the bourgeoisie dovetails with Foucault's point in footnote xxviii, concerning the town being the site of revolt; the French Revolution marks a critical historical moment of class articulation. In the most basic sense, the bourgeoisie is the social class that came to own the means of production during industrialization, and both property value and the preservation of capital to ensure the perpetuation of their economic supremacy become their legacy in the development of the modern State. In English, the French word *bourgeoisie* implies a social status oriented towards economic materialism and hedonism as linked to upholding the political and economic interests of the capitalist ruling-class.

[xlviii] Foucault proposes that when 'population' is introduced to economic theory and practice, a new subject, a new subject-object comes into being. Thrift's articulation of the public, as in public intimacy, I think, builds on Foucault's identification of the 'population.' Foucault highlights how the 'naturalness' of public desire is a function of the market, economy and governmental technique: "that from one direction the population is the human species, and from another it is what will be called the public. The public, which is a crucial notion in the eighteenth century, is the population seen under the aspect of its opinions, ways of doing things, forms of behavior, customs, fears, prejudices, and requirements; it is what one gets a hold on through education, campaigns, and convictions. The population then is therefore everything that extends from biological rootedness through the species up to the surface that gives one a hold provided by the public. From the species to the public; we have here a whole field of new realities in the sense that they are the pertinent elements for mechanisms of power, the pertinent space within which and regarding which one must act" (73-75). In other words, the natural-ness of a whole affective range of human life comes under the purview of a governmental economy.

[xlix] Corbin also opines that by the mid-19th century, the assumption of the miasmatic danger of the poor became linked to their mere presence, an affect of terror which helped the bourgeoisie to sustain this self-indulgent and spatially partitioned ideology.

[l] Women in particular were placed at the center of the purity of a domestic scene, produced as such, and the development of a "woman's atmosphere" part and parcel to the home materialized in/as the proliferation of cosmetics. Commodities, endowed with conferring multiple kinds of status, included proprietorial relations ("the wife […] had become the man's standard-bearer" and "the ceremonial consumer of goods which he produces" (Corbin 1986, 82). More women began to present their gender in dexterous applications of scent, a subtle calculation of bodily messaging that led to "a reduction in the strength of olfactory signals and an increase in the value assigned to them." (176) Corbin notes how a "skillful arrangement of background smells in the boudoir came to be aesthetically inseparable from the odor of the woman to whom one came there for inspiration."
For further accounts on the 18th century purification of public space and bodies alike, see Corbin 1986, specifically Chapter 6: *The Tactics of Deodorization;* Levitt 2023**;** and Le Guerer 1992 and 2005.

[li] The commentary on the imbrication of women and flower in the 19th century occurs in many fields of critique, art history, literature, poetry, and cultural studies concerned with the politics of gender; Seaton 2012; Green 1990; Smith 1981 each provide a different lens, though none through the perspective of smell.

[lii] Another spatial metaphor that becomes exactly literal in my work emerges as Thrift writes, "In past consumer societies, the object world only very rarely was sufficiently populous that it could routinely produce atmospheres." (299) At the level of production and consumption, he posits a scalar shift. But the metaphor he uses, is one of global systemic effect, science of which emerged as part of the making sense of new climes as Europeans collected specimens from world around and tried to make them live in Europe. He continues, "But, I would argue that this kind of world making has now become an activity that involves much more than just the individual commodity. Rather, it involves the proliferation of performative object-fictions, in which sight, taste, touch and the other senses combine to trigger cognitive heritages we are only vaguely aware of, the result of a vast increase in the palette of materials that are on offer that are able to produce marketable materiality." With this we might read his atmosphere as more than nature, a historical assemblage of ideas experiences and knowledge materialized by objects. Heritage moves in and through them, and the ideas & symbols of a time accumulate in them, in un- or supra-conscious awareness, that occurs as sensory cognitive experience.

[liii] In *The Archive and the Repetoire,* Diana Taylor discusses *performance* as a methodological lens wherein embodied practice functions as an epistemology; it offers a way of knowing. Performance, from the vantage point of a repertoire, is an of the aesthetics of everyday life are in situ an intelligible in the framework of an immediate environment and the issues surrounding them. What I have called repertoire, then, following Taylor, is an understanding of performance as embodied praxis and episteme, uniting sources of knowledge (in the archive generally conceived of as objects) with knowers, that which is enacted

in/as relation. Repertoires, by Taylor's highlight, require presence and participation, actions that are repeated but not the same, processes of selection and transmissions which thereby generate and transmit knowledge. The simultaneity of the emergent and historically born character of the repertoire is a central dynamic I wish to highlight in my analysis of smell, and plan future writing around the intersections and complements that performance, materiality, and critiques of smell yield together.

[liv] I like to visit both Mintz and Tsing for different articulations of the excess life worlds commodities both produce and come from-- their multiple historical, labor and extractive conditions as well as the enduring material-sensory apertures they produce. (Mintz 1986; Tsing 2015)

[lv] The term jumps off from Raymond William's *structures of feeling*, which refers to the conditions of emergence of affect and thinking at any one time in history. Such articulations come out through textual gaps: between the policy discourse, popular responses to official texts, and the appropriation of both of these in artistic forms. Williams uses the term *feeling* rather than thought to register the affective aspect, signaling that what is at stake may not yet be articulated in a fully worked-out form, but possibly inchoate or between the lines. The atmosphere, or cultural…moods that circulate in a given era are palpable or discernable in works of art, as well as in commodities, and as I argue, the sense of smell. (Williams 1954)

[lvi] Turgot was a French early Liberal economist and statesman, often considered a physiocrat. He employed laissez-faire economic reforms during his thirteen-year appointment (1761–1774) as chief administrator for the Limoges district under Louis XV and as minister of finance, trade, and public works from 1774 to 1776 under newly anointed Louis XVI. In the latter, he abolished all restrictions on sales of grain within France, and ended the national policy of conscripting labor to build and maintain roads, and replaced it with a money tax. Turgot also abolished the guild system, and reformed restrictions related to contemporary practices of occupational licensing which prevented workers from entering certain occupations without permission.

[lvii] None of the early perfume houses could produce the entire range of essences necessary for perfume production given material diversity and quantities desired. Given the variability of harvests and production, they each had to rely on multiple suppliers. Perfume houses thus became highly dependent on one another, a feature of the perfume industry that persists today, although in a significantly different political ecological configuration. Interestingly, he was also the Comptroller of General of Finances in Paris and promoted research on waterways in the articulation of the public health and hygiene regimes named above.

[lviii] Absolutes are present in heart and base notes, and are therefore generally richer, rounder, and more enveloping than essential oils, for example, which are yielded through distillation, and often more present in top notes, as they are fresher and more volatile.

[lix] In spite of the lowering of their costs, some producers decided to maintain their original high prices by renaming and conferring a symbolic value on products that had become available at lower prices. The emergence of a luxury market, which shifted the value of products from their basis in the cost of raw materials to a symbolic level, is the central focus of Eugenie Briot's 2011 article cited herein.

[lx] At the same time, the population of Paris, the first consumers of these products, grew considerably as well (from 547,000 inhabitants in 1801 to about 4 million in 1901), but the growth occurred at a slower rate than the consumption of scented products. The expansion of the total French population (from 28.25 million in 1801 to 38.96 million in 1901) was also less rapid. (Briot 2011)

[lxi] Alphonse-Honoré Piver, for example, was knighted in 1867 and was made an officer in 1878. His son, Lucien Toussaint Piver, was knighted in 1900. Aimé Guerlain received a knighthood in 1892. (Briot 2011, 278)

[lxii] Sevres was the preeminent porcelain manufacturer in Europe in the second half of the eighteenth century, and its enduring material presence reflects many of the changes affecting French society in the years between 1800 and 1900s as it stayed continuously at the forefront of European ceramic production despite many changes, to say the least, in technology, taste, and patronage that occurred during this tumultuous century. Louis XV had been an early investor in the fledgling ceramic enterprise and became its sole owner in 1759, after which the company underwent many forms of technical and stylistic revolution to this day. Brongniard is known for new enamels, kiln designs, advents in porcelain pastes, and a breadth of decorative designs otherwise.

[lxiii] He responded instead to his own managerial interest focused on the problems of running a family business. DSM (Dutch State Mines, a Dutch multi-national company that transitioned from coal mining to chemical commodities in 1973 and that until recently focused heavily on vitamins and enzymes) had just bought Firmenich (June 2022). His emphasis was on the historical value and familial structure of the company, an era coming to a close, mentioning too that Mane and Robertet, two other local fragrance companies with global reach, were also family run. Masse knew the fathers and the brothers who ran each—and the successes of those family facilities were essential to the regional economy, a regional economy that had endured through regional lineage and leadership beyond the trend of its globalization. He was concerned about speeds of growth and the kinds of concessions that were made; he commented on the ways in which a shift away from a clear family business identity would, specifically, affect the psychology of management, a lamentation I heard with some frequency across Firmenich related interviews. *It's a usual one fish eats another story,* he sighed, referencing another corporate swallowing in the drafting of Jerome Bruhat from L'Oréal as CEO of Robertet, one of the world's largest manufacturers of natural fragrances and flavors, founded in 1850 and also based in Grasse.

[lxiv] Masse had—beguiling to me, given that he is the president of the regional perfume network—never heard of Perrin, a fact that goes unresolved in my inquiry.

[lxv] In a natural perfume class, I asked about the process of tincturing ambergris, and received a simple description: *use a mortar and pestle and grind it up, at a suggested a ratio of 1 oz of alcohol to 3 grams of ambergris, though 1:6 could work too.* As with all naturals, and this is perhaps what defines them as independent units, there is considerable variation depending on the exact measure of matter you are working with—the seasonality, the soil, the method of harvest and extraction all vary greatly. Animal, guttural matter is perhaps more obviously variable in this way. To deal with variation at this hand-craft scale, I was encouraged to use a chemistry grade heater/stirrer, one with the little glass magnet pill that rolls around the base machine's magnetic principle, round and round for a day, or a few hours at the least, to ensure even maceration amongst a broad sample.
[lxvi] See Footnote IV.
[lxvii] I am grateful to the Georges Lurcy Charitable Trust for funding a year's research in Grasse and France more broadly. Due to the coincidence of my research year with the outbreaks of Covid-SARS 19, I had to pivot my research plans and study perfumery through local and online institutions. This provided me with an enriching perspective on the dissemination/reverberation of the productivity of olfactory epistemological practices made in the French perfume industry.
[lxviii] Perfumer Michael Edwards published the first one for the perfume industry in 1983 to organize perfume brands and their output so that consumers could more easily acquire a bottle according to a language expressive of their preferences. Variations of his fragrance wheel have become a novel standard in coffee and wine brands who employ it to support claims of their product's superiority, while providing consumers with a rehearsal of expert language as it intersects with class and taste.
[lxix] The *Fougere* name comes from fern in French. *Fougere* perfumes are made by sweet top notes, with a prominence of lavender, oakmoss, and coumarin. Many fougere perfumes emit various citrus, herbaceous, green, floral and animalic notes, and the most common additions are vetiver, geranium, and bergamot, which is often added to enhance the sharpness of the lavender top-note.
C*hypre is* a family (or *concept*) of perfumes named for the island of Cyprus. Its connection to perfumery originated with the first composition to feature the bergamot-labdanum-oakmoss accord. It is characterized by citrus top notes, a middle centered around cistus labdanum (see footnote iv and amber accord next chapter), and a mossy-animalic set of base notes derived from oakmoss—a scent derived from a species of lichen and described as woody, sharp and slightly sweet. The composition is usually enhanced with a floral component through rose and jasmine; animalic notes such as civet can be added to this accord to provide richness, but are less popular in contemporary blends. Chypre perfumes fall into numerous sub-classes according to their modifier notes, which include but are not limited to *leather, florals, fruits,* and *amber.*
Spices is the renaming of the olfactive family recalled from its long orientalist designation 'Oriental.' Perfumes in this category follow the structure of the amber category, with enhanced camphoraceous notes, and the addition of a spice profile. perhaps the category of perfume that are the easiest to make smell good. They are comprised of a balsamic base (woody, spicy, resinous, occasionally animalic), a floral middle (generally a heavy floral like ylang-ylang and jasmine), and a citrus top. The structure follows a basic heavy to light progression. The famous *Shalimar* is built on the sweet powdery base of oppopanax, another spicy balsam, patchouli in the middle mixed with rose, jasmine and vetiver—a woody floral bouquet, and lemon, on time with notes of bergamot, mandarin and rosewood. The scent makes olfactory a Victorian era's orientalist imaginary of a Middle and Far East (examples include Guerlain's 'Shalimar' and Yves Saint Laurent's 'Opium') and is currently being renegotiated in nomenclature and reference by a new generation of perfumers who are not European men.
Gourmands are a new category of fragrance, and consist of primarily of edible notes like honey, chocolate, vanilla, coffee. The top and middle notes may be blended with non-edible base notes such as patchouli or musk, but are often dessert-y in overall profile. Due to correlated developments in compound design and synthesis technology around 1945, new categories have also emerged to describe modern scent scaffoldings,
Aquatic, Oceanic, Ozonics— The newest category, first appearing in 1988 with Davidoff's *Cool Water.* This category is characterized by a clean smell reminiscent of the ocean, and led to the development of many more androgynous perfumes. The family generally contains *Calone*, a synthetic discovered in 1966 that provided fodder for the entire categorical exploration.
Bright Floral— Combines Single Floral & Floral Bouquet traditional categories
Citrus— An old fragrance family that until recently consisted mainly of "freshening" eau de colognes due to the volatility of citrus scents. Development of newer fragrance compounds has allowed for the creation of more tenacious citrus fragrances.
Fruity— Featuring fruits other than citrus, such as peach, cassis (black currant), mango, passion fruit, and others.
Green— Lighter, more modern interpretation of the Chypre type, with pronounced cut grass, crushed green leaf and cucumber-like scents.
[lxx] Labdanum is a low Spanish and otherwise Mediterranean bush with papery flowers, also called *cistus* or *rockrose*, that exudes a resin and is historically culled through the combing out of the resin from sheep exuded resin, la, papery flowers. Labdanum is yielded through solvent extraction using hexane, a process that yields *a perfectly good and thorough ingredient* that, as Ashley says*, can be over-complicated by perfumers who also render it through cistus essential oil*—a paralleling amber ingredient that is yielded through distillation instead, yielding a cloaked and oily version of the same plant.

As a scent note, Labdanum opens softly as earth but immediately intensifies into a sharp, pungent balsamic density. Some bright green sensations vibrate at its limit, but the mass of it remains a dark amber. It is agrestic and rich, and after a loud entrance, its heaviness becomes etheric, intoxicating. Its tenacious and ambery olfactory qualities resemble ambergris, and it is valued in the perfume industry to make an adjacent impression where ambergris sale and use is restricted. It is the main ingredient used when composing a perfume with an amber profile, as its variable musky, woody, leathery qualities are what make it stand out.
[lxxi] My notes on the three read as follows:

Labdanum opens sweet. It is just as quickly leathery, and simultaneously boozy. It is honied and fruity like dried fruits—prune. It's a little sticky, and a little gooey. Visually, it is dark and opaque, the smell is like that too. I take a slower inhale and perceive a low saline tone that way, backed by thin soil, a sparkly, dry earthiness.

Benzoin Siam blooms more slowly, a breathy sensation of oozing plume. There is the sweetness and spice, cinnamic punctuation and also alcohol ether. A faint phenolyic note calls out, reminiscent of bandaids and a wink of antiseptic. Quietly, one can sense a hint of cherry, a dab of incense and an echoing sensation of sharpness. Slowly, sensitively, a milky powdery facet comes out, one I notice most evident in Benzoin Coeur (a poetic leather emphasizing title-characterization that reflects a fractionating process in which the middle portion of distillate is kept whilst the top and bottom are thrown out, yielding a cleaned off sense of smell). Natural materials are most generally partitioned by their Latin plant and animal names, countries of origin, and extraction methods, all of which have a profound impact on odor. Benzoin Sumatra, for example, is less vanillic and more quiet incense-like than Benzoin Siam, which was the central note we used in this class.

Vanillin is… *vanillic* the teacher says. It has a similar intensity to vanilla extract with the accompanying spatial boozines as well as the sweet and powdery aerates. It harkens to pastries, cookies, sweet treats. Whereas real vanilla carries some smokiness and sheerness in addition to the honey-funk of Castoreum (anal sacs of Canadian beavers), the contours of vanillin are more simply defined. Functionally, technically, for example, we are told that the impact of vanillin doubles over time. While no single class can help a nascent perfumer leapfrog the years of practice and experience that comprise the effective embodied archive that is a master perfumer, classes like this can offer practical steering suggestions and caution. For another example, Iso E Super is very sheer so vanillin can easily overpower it. A perfumer can therefore dilute it from 10% to 1% or even less, and rehearse it in different doses.

[lxxii] Ambrox DL (aka Cetalox), for example, is a powerful, woody, intense and even slightly metallic reproduction of ambrein patented by Firmenich in 1988. Cetalox emerged from a series of synthetic experimentations—the development of a new chemical synthesis route—that was invented to avoid a clary sage shortage (more in the following chapter). Performance wise, and it is designed for performance, it is suggested that it be used at less than 5% dilution, for it is strong and enduring, remaining up to one month on the blotter (base note and fixative by a synthetics timeline), and its substantivity is effective both dry and damp (doesn't evaporate/doesn't dissolve easily). Its molecular weight is 236, its chemical name is Naptho [2,1-b]furan, dodecahydrio3a,6,6,9a-tetramethyl, it is between 30-70% green, and it is "ultimately biodegradable."

[lxxiii] In the early phase of the book, Levitt develops some details concerning the depths of embroilment of aroma and perfume in State/domestic affairs; for example, chemist Antoine Lavoisier's fight to stabilize the government's gunpowder supply, which was disequilibrated by a growing demand for soap, as both items required alkalis from the ashes of the barilla plant, whose supply Spain had cut off in that year; the State was pulled between competing modern commitments between hygiene and militarism. We also catch Napoleon bathing in and drinking gallons of perfume, the ethyl alcohol substrate of which was not replaced with methyl alcohol (poisonous) until 1872 in France, when the switch was made for tax reasons.

[lxxiv] In *Synthetic Worlds, Nature Art and the Chemical Industry*, Esther Leslie examines the multi-valent temporal reaches of geological accumulation projects, specifically the new aesthetics that carbon-mining scientific exploration makes possible. From vertical earth column carbon harvests, Germans transformed charcoal into myriad chemicals yielding pharmaceuticals, hallucinogens, inoculations, and paint pigments alike—and here she zeroes in on the work of Runge on Leukol, the first synthesis of coal tar, and also later indigo. She unfurls links between the emergence of new possible color palettes in painting with military investments in spatialized violence (Leslie 2005). See also Benjamin Labatut on the political historical relation between bitter almond, cyanide, coal (Labatut 2021).

[lxxv] Pasteur is, in particular, credited for the modern comprehension of bacterial causes of disease and the development of vaccines as a regime-shifting preventative measure; his scientific offerings substantiate a significant epistemic shift from previous epochal dependence on and practice of the miasma concept (see Chapter 2: *Object Affects*).

[lxxvi] Industrial production of these synthetic aromas ramped up between 1879-1900, and the price of Coumarine fell from 2550 francs to 55; a kilogram of Vanillin fell from 8750 francs to 60 around that same time frame.

[lxxvii] See Chapter 2: *Object Affects*

[lxxviii] A general timeline of famous historical perfumes that adopted synthetics fresh out of the lab include: *Fougère Royale* by Houbigant (1884) containing coumarin; *Jicky* by Guerlain, containing vanillin and linalool; *Vera Violetta* by Roger & Gallet containing alpha- and beta-ionone; *Trèfle Incarnat* by Piver (1898) containing isoamyl salicylate; *La Rose Jacqueminot* of Coty (1904) containing Rhodinol; *Après l'Ondée* by Guerlain (1906) containing para-anisaldehyde; *Quelques Fleurs* by Houbigant containing hydroxycitronellal; *N degrees 5* by Chanel (1921) containing the aldehydes C-10, C-110; and C-12; *Nuit De Noël* by Caron (1922) containing 6-isobutylquinoline; and *Femme* by Rochas (1944) containing the 'so-called' aldehyde C-14 (gamma-undecalactone) (de Nicolaï 2008).

[lxxix] Korzh, L. N., and L. I. Strigina. "Chemical composition of different varieties of ambergris." *Maslo-Zhirovaya Promyshlennost* 10 (1972): 25-26.

[lxxx] The term 'class' in biological organization of the world is still in operation, in this case indicating leaf structure, that is, sprouting on two sides—a visual taxonomy. Other structuring principles like *clade*, referring to descendent lines, preclude the possibility of connecting clary sage and sperm whale, and chemistry emerges as a new, postmodern, kind of organizational rationale.

[lxxxi] Ever more complex nomenclature becomes sutured to the laboratorial whale to describe its new possibilities of affect: Methyl dodecahydro trimethyl naphthofuran (Ambrox), ethyl dodcahydro trimethyl naphthofuran (Grisalva), homo cyclo geraniol, ambrarome absolute, dynamone, grisambira (I), 2-hydroxy-2,5,5-trimethyl octanile (α-ambrinol), 2-hydroxy-2,5,5trimethyl-8,8-A-epoxyoctaline (Ambrin-oloxyde_. Oxambrol, muscambrol, muscarome, castorol, costia, oxambria, Indian wood, 2,6-dimethyl-bicyclo-decanol (Geosmin), homocyclogeranyl chloride, γ-homocyclogerniol, ambraldehyde, amrabketal, (II), dihydroactinidoide, and dihydroambrino (III) are the names of the molecular compounds gathered under contemporary chemical essence designations of ambergris.

[lxxxii] The syllabus for the perfume course was a little ambiguous in terms of the curriculum logic, but opened immediately with a discussion of materials concentration and dilution, with an emphasis on longevity/endurance as a function of concentration. Within the first few words, the course was framed from an industry and market perspective in relation to what to expect from and how to use the materials, and the 'brand' concept oriented the presiding logic.

[lxxxiii] In the enduring legacy of the Grasse perfumer's guild, the fragrance industry is notoriously difficult to penetrate. In fact, of the perfumers I have been connected with, every single one has been introduced to me by the slim aristocrats I have dined with—an affordance of the elite educational institutions within which I have trained. Today, perfumery toggles a class system, evidenced by the impermeability of Firmenich's *Fine Fragrance* HQ on Madison Ave. and its cultural rift with the fragrance production campus in New Jersey, and the genre's ground-breaking open-source offerings at the Institute for Art and Olfaction (IAO) in Los Angeles. While the economic fragrance chemical form has unleashed aromatics unto all populations, class still reigns in practice.

SV, a perfumer at the Firmenich fragrance division in Princeton, was introduced to me by her cousin—a four-named Swiss aristocrat I worked for one summer who grew up in Newport, RI, and who had a sincere penchant for ordering people around. SV shared her flair for power, but expressed it with a professional grace suiting her archetype as a perfumer. We had corresponded for months, and she had finally been given the 'ok' to receive me as an NDA-signing researcher on the topic of *the history of ambergris* at this facility.

[lxxxiv] The corporation boasts that they reach *4 billion consumers several times a day, in more than 100+ markets: from their breakfast cereals and their coffee in the morning, to their shampoo, shower gel & fine fragrance when they go out at night.*