UNIVERSITY OF CALIFORNIA, SAN DIEGO

From “Sexy” to “Risky”: The Variegated Life of Tobacco in the United States of America

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by
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The Thesis of Amrita Achamma Kurian is approved, and it is acceptable in quality and form for publication on microfilm and electronically:

Chair

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# Table of Contents

Signature Page................................................................................................................................................... iii
Table of Contents................................................................................................................................................ iv
Acknowledgements.......................................................................................................................................... vi
Abstract............................................................................................................................................................ vii

## Introduction ..................................................................................................................................................... 1

- Genesis.............................................................................................................................................................. 2
- Actors and Controversies..................................................................................................................................... 5
- Orientation.......................................................................................................................................................... 8

## The Brief History of Tobacco Cultivation in the United States of America.................................................. 11

- A Lucrative “Herbal Panacea”.......................................................................................................................... 11
- Cultivation in the Colonies................................................................................................................................... 13
- New Frontiers in the Cultivation of Tobacco....................................................................................................... 18
- History of Networks................................................................................................................................................ 23

## The Becoming of the “American icon” of the Twentieth Century............................................................... 26

- The Chemistry of Addiction.............................................................................................................................. 27
- Industrial Symbiosis........................................................................................................................................... 29
- Tasty Design........................................................................................................................................................ 31
- Situated Design.................................................................................................................................................. 33

## The Science of Risk and Risky Science........................................................................................................... 36

- Construction of an artifact.................................................................................................................................... 36
The Early Signs of Trouble.................................................................38

Resurgence of Scientific Studies of Tobacco: A Paradigm Shift?..............41

History within History: The Rising Voice of Scientists Studying the Effect of Tobacco and Cancer.................................................................44

An Interlude into Epistemology: Scientific Uncertainty, Problem of Causation and the Rise of Epidemiology.................................................................47

Getting their act together: Public Health, Regulatory Bodies, Science and Law..................................................................................52

Public Health Regulation and Science..............................................52

Law and Science..............................................................................55

The Architects of the Empire and Their Clever Designs.......................58

Advertising Risk.............................................................................58

Public Relations, Manufacturing Doubt and Responsible Corporates........62

Tricky Design: The “Thermodynamic Impossibility” of filters..............67

Conclusion.......................................................................................70

Short Note on Risk...........................................................................74

Bibliography....................................................................................77
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ABSTRACT OF THE THESIS

From “Sexy” to “Risky”: The Variegated Life of Tobacco in the United States of America

by

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The thesis is an attempt or exercise in viewing the changes in the material nature of a substance through history. The thesis traces the history of tobacco, as cash crop, consumer product and addictive drug through institutional and discursive spaces, to demonstrate how material changes in tobacco, as result of sustained human intervention, has changed its chemical, physical and social nature. Simultaneously, I also show the effect of tobacco on some of the institutional and discursive spaces over time. In the thesis, I look at five spaces through which tobacco weaves in and out, agriculture, science, public health and law, tobacco industry and popular imagination. I also show how historical contingency, manipulation and accidents conspired to co-
constitute the spaces and the substance through time, ultimately leading to the “risky” substance and consumer. I question the objectivity and universal rationalism of the scientific practices by demonstrating its “situatedness” within national-global power dynamics and the effects of scientific beliefs on advertising and the tobacco industry that led to the physical-chemical manipulation of the natural substance tobacco and vice versa. Central to the project is then a critical understanding of scientific practices as well as of the “object” of scientific study. The project shows that neither scientific practices nor object of scientific study can be viewed as stable concepts. However, the project is not a rejection of ontological realism rather it aims at a pragmatic understanding of the “constructed” nature of substances and practices. The ethnographic context I explore is mostly confined to the boundaries of the United States of America; however, it simultaneous shows how such categories bleed into others in the global movements of tobacco.
Introduction

“Much like sex during the Victorian period, objects are nowhere to be said and everywhere to be felt. Like humble servants, they live on the margins of the social doing most of the work but never allowed to be represented as such.” (Latour 2005, 73)

Tobacco killed about 100 million people in the 20th century. Tobacco now kills 6 million people every year, more than AIDS, malaria, and traffic accidents combined. Cigarettes deaths in the United States alone are akin to the crashing of two jumbo jets on a daily basis. Cigarettes are a greater cause of death than bullets, terrorist attacks, and natural disasters. It is the Titanic sinking every 27 minutes for 27 years. Cigarettes remain the world’s single largest preventable cause of death. These are some of the common phrases used by authors, public health officials to describe the tobacco fiasco of the 20th century. On the other hand, Allan Brandt (2007) describes cigarettes as the “prototypical” and “emblematic” product of the century, which deeply “penetrated American culture” (2-3).

There was a cigarette for every occasion and person. Cigarettes catered to every kind of consumer, be it the rugged masculine “men’s men”, the farmer and the cowboy, through the iconic figure of the “Marlboro man” (263), or the slender and conscious woman who chooses “a Lucky instead of a Sweet” (71). Cigarettes added to, if not created, the conscientiousness of the life-saving doctor who recommended
and smoked only “Camels”. Cigarette usage were indicators of the classy-ness of the Black Americans “coming up” in the post-Jim Crow era to join the growing consumerist culture (Jain, 2003). Cigarettes were an essential ingredient to the pleasures of love, camaraderie and panache. However, these symbolic qualities of cigarettes and cigarette smoking seem to have radically changed in the past fifty or so decades from pleasurable and sexual to filthy and risky. The obvious question of a concerned naïve onlooker is that if it is, in fact, proven dangerous then why not take it away from the shelves in supermarket and pharmacies. The enquiry into the long history of tobacco (and its particular manifestation as cigarettes) begins with this simple question. The answer to which implicates everything from liberal individualism and style, agriculture and farmers, science, public health and tobacco industry, legislation and judiciary, design and technology to smoker’s rights and nonsmoker’s rights.

**Genesis**

This enquiry is at once the tale of constraints, of things, the construction of facts, the regulation of actions and designs through litigations, deception and fraud, accidents, and finally, of risk. More importantly, it is a narrative of self-administered death, contradictory as it may sound, extolled in the liberal virtue of individual choice. The choice is seemingly cast as one between the individual right to choose or to succumb to government paternalism. A slogan touted to death by the tobacco industry. The enquiry, I propose, does not entail the recourse to anthropological category of culture, or American culture, advocated by many academics of addiction and risk
(Jasanoff 1986; Nichter 2003) to understand this inter-related, incomplete co-
constitution of things, institutions and discourses. The situated practices of certain
groups are pertinent to understanding the affective charge of cigarettes (felt only by
certain target groups and not others) and their incorporation into everyday activities.
However, this focus should not be conflated with cultural determinism and should in
no way mask the geopolitics of global capitalism, or the wilful manipulation of the
industry or the lethal nature of the thing, tobacco. Moreover, whose culture and how
this culture gets distributed and re-distributed through nationalist rituals, legal
codification, and access to mass media become important in the study of risk. How
does such cultures create risky individuals? What is their subject position? More
importantly, what is the nature of their biological or physical bodies?

However, I must admit that the project began as a self-ethnography, locating
oneself as an actor in a perceived new geography. The contradictory nature of
smoking was one thing, but it combined with a sense of discomfort felt in the
perception of others. This discomfort in others and the guilt it induced in me warranted
a cultural understanding of smoking in the United States. Nevertheless, all my
stereotypes of “Americanisms” were broken at both ends. People defied my carefully
constructed boxes/stereotypes, one being that of individualism and individual space in
the States. There existed a highly symbiotic collective of complete strangers
connected to one another by the act of smoking. This symbiotic collective seemed to
be further solidified by the impressions manifested in the non-smoking others. Such

1 A reflection of the isolation I felt rather than my “immersion” into anything/anyone
American
that, a smoker could “bum” cigarettes from another complete stranger, whose only common quality with the smoker is the act of smoking. Secondly, my perception of white, upper middle class of La Jolla as mellow and polite people crashed when a random stranger, who fit the above description, screamed at me to “get an education”, only after vividly describing my potential “rotten teeth” and “ashtray breath”\textsuperscript{2}. What could have brought this reaction in the country of freedom and individual choice? Finally, people gather at certain self-disciplined spaces; crowding around a lone ashtray, or an open terrace experiencing the same bouts and satisfaction without acknowledging one another. The strangeness of this sense of togetherness-while-being-strangers and my location in this space initiated this project of looking into the process of constitution of this space. A specific space constructed differently and yet so similar to my experience in and of India.

The objective was to study history but history pertaining to a specific artifact, cigarettes, located within a situated boundary. The choice of looking at non-human actors whether in the form of cash crop, artifact of scientific analysis or mechanized mass-produced consumer product is an important political choice, for, in the process, neither the cigarettes nor the USA held still.

Notions of culture or nation could not circumscribe the history of tobacco, which across time wove in and out of boundaries, of nations or of distinct discursive

\textsuperscript{2} In India, I have been subjected to several modes of vigilantism and moral discourses with regard to cigarette smoking, but these were mostly an attempt at controlling the behavior of women.
realms. What seemed to have emerged is a network of actors, consisting of non-human and human actors, that metamorphize like an amoeba through history; or, of a controversy that has surfaced into visibility, thanks to decades of debates around health, morality, deception and fraud. More importantly and most unfortunately, a certain death toll and prevalence of chronic diseases was needed to make this controversy visible to the public eye and decades of statistics to draw the attention of the government, regulatory organs and judiciary. The drawback of this project is the absence of my initial concern of locating the smoker within the network. While it remains the most pertinent question, for the purpose of this thesis I draw a line at locating the “risky” subject without delving much into her subjectivity.

**Actors and Controversies**

The recent public health and scientific debates on the ill effects of tobacco and the subsequent exposure of the gigantic fraud by the tobacco industry has opened up for research a large body of work. This has allowed for the scope of enquiry to range from the microscopic traits of tobacco, like chemical structure and neurobiological effects, to tobacco’s social life as an agricultural crop, the changes in its basic chemistry and qualities over centuries and its impact on human and non-humans. The availability of certain materials itself attests to the visibility of a controversy at a particular historical juncture. Here, I use the term controversy in the sense Latour (1987, 2005) uses it, as the juncture when the latent social ties emerges or when the

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3 These realms pertain to categories of disciplines and concepts prevalent in anthropology. I admit that in spite of her efforts she has not been able to transcend them. In fact, the boundaries may have been reiterated against best intentions.
black box of established scientific facts are re-opened bringing into visibility the “constructedness” of its form. Though Latour’s analysis has mostly pertained to non-human actors in the scientific realm within a synchronic assemblage, I have extended it to cover centuries of processes, people and events (in no way exhaustive but channeled in the direction of my interests).

I take Latour’s notion of the social as a dynamic interaction of non-humans and humans. Social becomes the object of a study in a moment of clarity, or precipitation of movement within a network, the “reassembling” and “reassociation” of different entities. This movement of networks can be held still long enough to trace association only to find those associations change shape, or rather to see those associations recast as something other than what is described (Latour 2005, 5, 65). Non-human objects have been removed from social analysis of actors and agency, according to Latour (71-72), because actors are posited as having intention and reflexivity capable of producing meaningful actions. Latour uses the term “actant” to denote non-human and human entities “whose actions make a difference to another action” without necessarily implying an intention (71). Thus, objects are actants, which determine, frame, authorize, allow, and prevent other actions (72). The artificial separations of non-humans from the realm of humans have created the unbridgeable epistemological rift between sociology and science.

I have used some of this implication in my study but have retained the term actor to denote non-human objects. This is not to impute superhuman capacity or even human capacities onto an object but to chip away or erode (not to do away) from
human intentionality and rationality of choice. An erosion without resorting to cultural determinism (one that makes “primitives” do the thing they do while the “civilized” choose). I have manipulated concepts from Latour’s analysis to fit my project not because I disbelieve in choice or intentional action but because it has been given more credence than it deserves in Western philosophy.

Daniel Miller (2005) terms this the “humility of things”, an understanding of which is necessary for the “dethronement” of humans (5, 37). For Miller, like Latour (2000, 2005), studying material things do not mean reducing it to a reification of subjects and culture but to understand objects as it constrains, allows, and enables normative behavior. However, the most effective object is one that is invisible to us (or recedes from our reflective projects). An object surfaces into visibility when it fails to do its function, much like cigarettes in this project. Heidegger’s example (quoted in Jain, 2006, 5) of the carpenter’s tools is illustrative of this humility. A carpenter’s tool is an extension of her body until it is not. Wounding or injury is one “mode of attention” that “bring object into being” (5).

The ample amount of literature available on smoking and tobacco in United States is an illustration of Jain’s “mode of attention” or re-opening a controversy as Latour calls it. The specificity of consequent actions depend (as will be seen) on the particular state of science, injury laws and public health bodies available within the boundaries of the United States of America, a sovereign space. For Jain (2006), injury laws and design are the modes by which wounding, especially by consumerist products, are addressed in the States. My project is not an exercise in descriptive
history (if it is, then it is poorly done) but an exercise at inserting objects as actors into a narrative to see how they may change its shape.

**Orientation**

The structure of the thesis illustrates tobacco’s movement in and out of discursive and institutional spaces through history. It is also illustrative of the changing nature of the plant over centuries and of the design of cigarettes in the 21st century. In turn, it shows how this changing nature and the design are co-constituted with institutional practices. This co-consitution can aptly be termed emergent or controversial considering the role of tobacco in shaping epidemiology, tort laws and public health, which is widely acknowledged in these respective fields. The disparate nature of the historical account attests to the changing nature including categorization of tobacco as cash crop, recreational and carcinogenic drug, or as a device of pleasure and addiction in the social imaginary. The history is in no way exhaustive, I only hope to provide a glimpse of this transmogrification. Many agents and institutions have been suppressed to accommodate others.

The first chapter outlines the discovery of tobacco and its entry into Europe from the New World. The chapter then sketches its re-entry into the Americas as a cash crop and object of colonialism. The nature of the plant and its interaction with local environment, weather, and settlers created a particular social organization and moral realm, which in turn fed into the plant and the environment in a constantly

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4 The interaction between different tobacco companies, their mergers, competition and breakdown have been largely left out. The alliance between colonial governmentality and capitalistic strategy that resulted in globalization of tobacco (especially into Asia and Africa) has also been left out of this project.
informative relationship. The above-mentioned actors further interacted with tax laws, treaties, mercantilism, trade, smuggling, and competition among European colonizers to create an emerging colonial society in the New World. Thus, tobacco cultivation from the 17th to 19th century played a causal role, though not a singular one, in abetting slavery, in global circulation of commodities and in the independence of United States. This interactive relation between various realms exist upto now though in altered networks and actors. They, in turn, have created new forms of hierarchies, domination, morality and cultures of cultivation. In course of its history, tobacco itself has been irreversibly changed along with agricultural technology and the economies of scale. These changes have affected the environment in many ways, which, unfortunately, fall out of the purview of this paper. The effect of erosion, monocropping and excessive use of chemical fertilizers on farmlands and its consequences is subject fit for another paper and has been temporarily black-boxed in this project.

The second chapter delves into the transformation of tobacco into a particular consumer product, cigarettes, because of the confluence of several historical events and actors. The chapter also discusses the popularity of cigarettes, some of which can be attributed to the specific form and chemistry of this consumer product that came to be characterized as the “American icon”. The third chapter looks at the rise of scientific studies on the effects of tobacco. This chapter looks at how the study of effects shaped scientific practices and warranted an epistemological and ethical paradigm shift within scientific communities. The fourth chapter pertains to the cognizance taken and actions that followed in the realm of public health that re-
asserted the relationship between epidemiology and public health while creating newer alliances involving activism. These newly asserted alliances, between public health and activism further reassembled the relation between science and law. The fifth chapter looks at the role played by the tobacco industry in this assemblage, which I contend is the oppositional edifice against which the ethical dimensions of the earlier mentioned institutions and their alliance was shaped. I also look at the tobacco industry’s engagement with cigarette designs and advertisement that attests to the contradictory nature of tobacco, which was the source of profit for the industry but intractable lethality may also have contributed to the industry’s fading reputation.

5 The industry through its constant denial and fraud provided the fuel for the forging of alliance between public health, scientific community and activists. Although, in many ways the industry played a positive role through its own research meant to divert the efforts of epidemiologists.
The Brief History of Tobacco Cultivation in the United States of America

A Lucrative “Herbal Panacea”

This chapter seems out of place in the larger project, but I attempt to do two things. Firstly, I use it to remind one that tobacco as a material did not exist in its current form throughout history. The chapter tries to illustrate how qualities that make tobacco appropriate for cigarettes are a cumulative process over centuries. These qualities and its extensive use in mass-production have in turn changed the nature of the environment, the process of cultivation and the life of farmers and laborers. The rise of Bright tobacco, mono cropping, soil erosion and contamination via chemical fertilizers attests to these changes. This cumulative process is not one of visionary intentional actions alone but involves historical accidents and contingent decisions. Secondly, it paints a picture of where cigarettes come from. Whose lives do a certain form of production, consumption and its regulation affect? To this end, I look at some aspects of tobacco farming, the moral life of farmers’ vis-à-vis the crops, laborers and the forms of surveillance in response to interaction with their immediate worlds. As mentioned earlier, this chapter is only a sketch to highlight the role played by a particular object, as a constraint, in the course of history.

Europe’s discovery of tobacco coincided with the discovery of Americas by Christopher Columbus in 1492. The natives offered Columbus, upon arriving on the shores of the New World, a bundle of dried leaves as a gift. His envoys later conveyed to him the peculiar nature of the native who went about their lives with smoke blowing out of their heads. The later colonizers, French, Spanish, and English, also spoke of
the varied use of the plant in different parts of the American continents. This habit was an integral part of the Amerindian culture and cosmology of healing; described by colonizers as “thirst-quenchers”, “vile heathen intoxicant”, “primitive balm” etc. (Heimann 1960, 8). In Europe, tobacco received the title of a possible “herbal panacea” within the Gallenic system of medicine and was classified as a curative and hallucinogen, which could alleviate thirst and hunger and induce altered states. Its acceptance in Europe proved crucial to the history of tobacco and its subsequent redistribution into other parts of the world (Goodman 1993). Although tobacco was accepted across all classes in Europe, its ascendance to a cash crop occurred much later; Goodman (1993) attributed this delay to the colonial focus on gold (38-49). The mode of tobacco usage differed in different parts of Europe depending on the region of their contact in America. Snuff, plugs, cigars and pipes were prevalent in Europe by the end of 17th Century (67).

Tobacco as a cash crop played a pivotal role in European colonialism and settlement, mercantilism, trade and agriculture in the American continent. Though the English were late in expressing interest in the New World, they created the Virginia Company in early 1606. The 17th Century saw the rise and fall of tobacco in several of the colonies in America mainly due to fluctuating prices of tobacco in Europe, the rise of sugar and the controlling policies of the Crown in Europe and in the America¹. By the end of the 17th Century Brazil, Chesapeake and Cuba were the only main centers

¹ Heavy taxes were imposed on Spanish tobacco and trade and smuggling were increasingly controlled. Moreover, treaties within Europe prevented domestic production of tobacco by the Privy Council in Britain by 1688-89. Taxes of tobacco imported were stabilized and export from Europe increased in course of time (London, Amsterdam and Glasgow becoming center for trade within and without Europe)
for importing tobacco into Europe. Although tobacco became marginal as a cash crop vis-à-vis sugar and coffee, it shaped the history of Chesapeake and in course of time made Chesapeake settlers a formidable force for the Crown to reckon with. The export of Chesapeake tobacco to French monopoly and Dutch Republic and the change in the nature of imports into Britain, especially of coffee, sugar, tea and tobacco, attested to the rise of an incipient form of consumerism and the changing tastes of the European populace. The routes followed by these consumer products simultaneously speak of the British influence and aggressive nature of its centralization policies\(^2\), which shaped the British colonialism as well as the settlements in the United States of America (Goodman 1993).

**Cultivation in the Colonies**

The history of tobacco in the United States is also a testimony to the influence of the plant and its cultivation on the nature, form and morals of the colonial settlement. Early tobacco cultivation was not based on economies of scale, unlike sugar and cotton. The high return of the crop per acreage allowed, albeit poorly, for the co-existence of both small and large farms. Moreover, tobacco farming was an extremely delicate process that required constant vigilance and care, and intense intervals of labor, and it relied heavily on indentured labor by newly immigrant Europeans and on family labor. High mortality, low population and the diffused nature of the settlement made contractual labor and servitude a norm. The fluctuating price of tobacco, the spread of new immigrants into new frontiers and the ability of indentured

\(^2\) The centralization policies sought to eliminate middlemen, small traders, smugglers and tobacco cultivation in other settlements making Britain the center for imports
laborers to attain freedom later resulted in the reliance of plantation owners on slaves. The system of indentured labor still assumed that once contracts (price) with settlers and government were paid, the immigrant could graduate to independent farmers or tenants. Indeed, many of the early laborers and tenants later joined political offices. Tobacco, unlike other cash crops like cotton and sugar, was never entirely dependent on slavery or on economies of scale, though there were periods were the latter contributed to the rise of the former. The labor intensive nature of the plant required a ready set of hands and these hands have alternated between indentured laborers, slaves, freed slaves share-croppers and migrant labor. Yeoman farmers were also an early figure in tobacco agriculture. However, in the early 18th CE, due to demographic migration the frontiers of tobacco cultivation were explored to the west of Chesapeake to Appalachia, North Carolina, Kentucky, Tennessee and Georgia. These regions were dependent more on family based labor than on slavery. In 1860, however, slavery increased to 40% in Pittsylvania from 27% in 1790 due to the increasing in scale of production (Goodman 1993, 167-169, 173). Reliance on slavery increased with the release of indentured laborers and their movements in search of new land outside Chesapeake. Increased reliance on slave labor in Chesapeake and the new regions also corresponded with an increase in scale of farmlands and production

The cultivation of tobacco and the culture that surrounded it had a lot to do with the nature of the crop, which in turn organized the symbolic realm of existence of the settlers. This fact stands even today though the terms and rationale have significantly changed from the Chesapeake tidewaters (see Benson 2008, 2012). The
Chesapeake settlement from the beginning of its existence in Jamestown dealt with adverse conditions of competition in other settler colonies, mortality due to diseases, and failure of the crop and price fluctuations. The first significant change was the crucial shift from *Nicotiana rusticum*, which was the indigenous variety, to *Nicotiana tabacum* from Trinidad that put Virginia Tobacco on the global trade map. *Nicotiana tabacum* found in the tropical regions was a larger plant with higher concentration of nicotine (Goodman 1993, 135-140). The chemical composition of the plant varied with the type as well as the soil, weather and method of curing. The plant had high economic potential and return per hectare of land. It was easy to grow in terms of field space, rate of growth and lifespan. Its short lifespan and fragility also meant that it was extremely labor intensive.

The cultivation of tobacco encompassed different stages that required different degrees and types of labor and care. The seed was initially cultivated in seedbeds to increase survival and decrease loss caused by infections and weeds. Seedbeds also allowed for closer monitoring though the process itself was not labor intensive. The transplanting, which occurred in late April after the rains, was on the other hand labor intensive. The intensity also corresponded to lack of technology like ploughing in early settlements. Weeding, suckering/topping and cutting of secondary roots, which formed on transplanting the plant, followed. All these processes were highly dependent on the weather and precise timing. A day’s delay could result in the loss of about 15 pounds of tobacco to an acre (Akehurst 1981: 27 in Goodman 171).

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3 Both types belong to the *Solanaceae* family (nightshades) and are two of the sixty species that were widespread in the Americas.
Harvesting of tobacco involved cutting of the whole plant. A process now abandoned for priming of leaves. Priming of leaves arose to homogenize the resultant tobacco product, which was impossible when cutting the whole plant. The homogenous nature of tobacco was conducive to making cigarettes while chewable tobacco did not require it. Cutting required precision not only of time but also of skill to prevent breaking of leaves. The cutter had to make judgments on the field regarding maturity of the plants, which would later affect the curing of leaves and prizing. Cutting occurred during September when the weather was extremely erratic and the crop was prone to destruction by frost. This process marked the beginning of the life of tobacco as a cash crop. The stalked and stemmed leaves were then cured, prized and piled into hogsheads (barrels stuffed or stacked with tobacco) to be shipped. Thus, as an agricultural crop tobacco required constant care, knowledge and skill, and labor available at hand. The only part of the year when labor could slack was during the initial period between December and January when the plant was in the seedbeds. The returns per hectare and the price of tobacco on import during the 17th and 18th centuries also made tobacco a viable cash crop in the United States (Goodman 1993, 170-73).

The relationship between the plant, environment, cultivating communities and colonizers in Britain is the theme for a thesis in itself. The flow of materials from United States into Britain was only a slice of the complex negotiation between the two continents. The packing of tobacco into hogsheads were priced on the weight of the barrel or the “consignment system” (Benson 2012, 66), which in turn made packing a
fragile process that required increasing of weightage without compromising the form of the leaves. Tobacco was never sold in the abstract but had to be sorted into grades. This increased the importance of the yield and the handling of leaves in the post-harvest phase (67). Moreover, the Chesapeake landowners exerted pressure on the Crown to control taxes on export from Chesapeake. As mentioned earlier, these negotiations worked to reduce agricultural production of tobacco in Europe, reducing alternate buyers such as the Scottish traders, making Britain a major center for the flow of this cash crop.

The contracts with merchants to export tobacco into Europe were a “badge of class” in Chesapeake (Breen 1985:36 in Benson 2012) which in turn opened the route for the flow of English goods into Chesapeake. These goods were used to maintain distinction among farmers. Tobacco agriculture affected the time (work rhythms), material and human geography of the settlement. It gave rise to a form of consciousness\(^4\) that had an obsessive grip on the gentry while a culture of debt festered (Goodman 1993, 174). More importantly, it generated a sense of worthiness among rich farmers, a probable reason for Chesapeake’s participation in the American Revolution in 1760 that followed the depression of prices and rise in liabilities to the colonizers (Benson 2012, 68). Chesapeake as a geographical settlement was spread-

\(^4\) This is detailed very well in Peter Benson’s (2012), *Tobacco Capitalism*. The tobacco plant demanded a lot of effort and attention from the planters. Its fragility also made it susceptible to decay due to blight, infections or climatic variation meant that most farmers had to keep a close watch on their crop. Moreover, the quality of tobacco was dependent on the perfect timing of various stages as well as on the type of cuts. Breakage of leaves or inattentive cuts could significantly affect the quality of the exported product, and thereby profits. These aspects of cultivation, according to Benson, led to a moral consciousness (of hard work, meticulousness and creativity) among the planter as well as a close scrutiny of farm hands (bordering on familiarity and animosity)
out and un-urbanized due to its landholdings, labor distribution isolated to farms, and low fixed capital of cultivation. Thus, cities of Baltimore and Norfolk developed at a rate different from other cities in the States. The social organization of slaves on the farm was also conducive to farming on large plantations in an otherwise sparsely populated area. They worked in roaming gangs that shifted from farm to farm doing specific tasks that increased their task-based efficiency while making monitoring easier for the plantation owners.

**New Frontiers in the Cultivation of Tobacco**

Chesapeake settlement differed from the new frontiers in Piedmont in 1740s. Unlike Chesapeake, which was largely built on tobacco and indentured labor, the new frontiers had a more mixed economy with smaller landholdings and less family labor. The soil in Chesapeake tidewater also differed greatly from that of Piedmont. The tidewater with its heavy, fertile soil was good for dark tobacco. But the fluctuation in quality of the soil also resulted in the fluctuation in the product. The tobacco from this region was termed as “oronoco” or “sweet scented” dark tobacco (205). The shift out of Chesapeake increased in the 19th century due to soil erosion and exhaustion. Piedmont, on the other hand, had loose sandy soil, which were low on nutrients and water, and was unfit for dark tobacco. Piedmont went on to become the center that heralded the shift to Bright Tobacco, which required fewer nutrients and produced a more homogenous product. The combination of sandy soils along with flue curing, i.e. the use of charcoal smoke instead of fire, air or sun, produced a bright yellow-orange
hue which were homogenous for the entire crop. The new form of tobacco was used for coating dark tobacco in plugs (Tilley 1948, 6-11; Goodman 1993, 205-07).

This shift occurring between 1820s-1860s and the advent of flue curing in the late 1860s forever changed tobacco consumption in the 19th and 20th centuries. Discovery of flue curing occurred by accident in the 1839 though its proper chemical process was understood only in the last decade of the 19th century (Tilley 1948, 57; Proctor 2011, 31). This discovery marks the beginning of the formation of tobacco into a mechanized, homogenous product of mass consumption. In Piedmont, the shift to Bright tobacco increased productivity, tenancy and land price while still allowing a place for family-owned farmlands. In the decades after the Civil War, Bright tobacco reach was extended to Kentucky and North Carolina. Around this time, the freed-slaves from Chesapeake joined farms in places like North Carolina as tenants and share-croppers (Goodman 1993, 196). It worked well for large farmers who could increase productivity of land. Here too, the formation of urban and rural population and geography and the culture of debt revolved was influenced by the cultivation of the plant.

Flue-cured tobacco prices rapidly soared for two decades in the early 20th century, which coincided with the industrial, mechanized production of cigarettes. The twentieth century also saw rapid changes in the culture of farming. The first few decades were years of profit, especially for regions growing Bright tobacco. Benson’s

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5 In 1919, one-third of the total tobacco product produced in the United States was Bright that increased to 61% in 1978. In 1864 a new tobacco called Burley also rose in Ohio which were air-cured. This form of tobacco along with Bright would constitute 90% of tobacco production by 1970 (208)
ethnography (2012) on tobacco farmers of Wilson County, North Carolina shows that by 1925 this area had high levels of tenancy and monocropping and low levels of yeomanry and black ownership of land. Hierarchies and moralities shifted to suit the new economy of industrial mechanization, where success was deemed a moral value of discipline and individual success not so much the result of institutional support and controls. On the other hand, black farmers who were structurally disadvantaged, from having lower farm holding, high tenancy debt to discrimination in auction barns, were often deemed lazy, easy-going, careless and wasteful (76). This continued into the thirties when as result of depression of tobacco prices, tobacco was incorporated into the Government’s Agricultural Recovery Program in the New Deal. Either most black tenants were evicted or became recipients of welfare only to be further stigmatized for being indolent and unworthy (78). The New Deal also promoted decreasing acreage in return for a guaranteed price. The deal was short-lived and was replaced by other acts in 1936. Rise of technology and fertilizers also reduced the need for labor (Goodman 1993, 198-99). The period after 1950s saw a strong shift towards mechanization of farms. These modes of technology and consolidation like “tobacco harvester”, bulk barns and pre-harvest technology (200-01), supported by the tobacco industry, were profitable for large farms. Legislation of 1961 and 1968 allotting benefits on poundage rather than acreage and selling of loose-sheet further decreased tenancy and leasing and small farms.

The tobacco industry now occupied the space once occupied by the Crown, merchants and the state playing an important role in shaping the geographies of these
areas. There are historical reasons the industry’s control of farmlands. Firstly, most of these changes occurred in areas that grew flue-cured Bright tobacco, which was the chief ingredient for cigarette blends. Secondly, and more importantly, is the role of James Duke Buchanan in consolidating the tobacco chain and building the first mechanized cigarette industry. He expanded his tobacco empire by expanding manufacturing capacities, consolidating the supply chain of tobacco leaves with manufacturing and marketing. His vertically integrated the industry creating bureaucratic departments to deal with different links in the tobacco chain. Although he sought to control tobacco from its agriculture to its sale, his reach remained at the level of monopolizing auction houses. The vagaries of labor and weather prevented direct interference with farming. He sought to expand the cigarette market much beyond its existing realm in the late 19th CE through hard-selling strategies and marketing technique. He was also responsible for the mechanization of the production of cigarettes, which he achieved by buying the patented Bonsack machine. Though disliked by his contemporaries, especially legislators and cigar owners, he had a large role to play in making cigarettes a mass-produced, mechanized, homogenous industrial consumer product (Benson 2012; Goodman 1993; Brandt 2007). The third reason for these changes was tobacco industry in the 1930s, which derived the profits of the depression of prices, sought, through legislative clout, to evade supporting farmers. Depression of prices had to do with the changing terrain of tobacco cultivation from the 1800, when United States produced 70% of the output decreased to 40% in 1910. The period after World War I was also one during which flue-cured
Bright tobacco was cultivated in Asia, especially China (Goodman 1993, 198, 210-11). Fourthly, later in the 20th CE as the voice of criticism from the public health and regulatory organs stifled the tobacco industry’s political and marketing strategies they started regulating tobacco at the level of farms. Philip Morris in 2005, anticipating FDA regulation on cigarettes, began a program of stringent quality control for tobacco leaves to reduce risk of carcinogens from chemical fertilizers and trash in harvested tobacco. The motto was to promote production of safe and clean tobacco (Benson 2008, 358).

These changes like mechanization of farmlands, rise of sophisticated chemical fertilizers, industrialization of cigarettes, legislations, influence of tobacco industry and change in global patterns of tobacco agriculture further changed the social relations of humans to other humans and to the environment. Fall of prices, mechanization of farmlands, and use of fertilizers in tandem with legislation effectively changed Wilson County and Winston into a white populace with the eviction of poor farmers, who were also often black. The industrialization and mechanization of cigarettes and the rise of cigarette consumption also increased the influence of the industry on the farmland, mostly as surveillance and quality control. This surveillance was compounded by the advent of scientific studies in the 40s and 50s, which proved conclusively the harmful nature of cigarettes, and the public health regulation that followed. The farmlands now relied on seasonal labor much more than tenants and sharecroppers. Mexican and Central American immigrants filled this void.

India and Dutch East Indies were the largest producers of tobacco but their products were mainly used for domestic consumption.
The relationship of farmers to these laborers, according to Benson (2008), reflects the terms used by the industry to sort good tobacco from bad. A binary model of moral values used in quality control of tobacco - clean as opposed to trash and foreign matter. The surgical precisions of quality control and private contracts have combined with government withdrawal of subsidies and guarantees have induced fear and insecurity into the lives of plantation owners and farmers. The pride, described associating discipline with good harvest is threatened by these new discourses of quality control and lethality of tobacco. Tobacco cultivation has become less about farmer's discipline or hard work as much as on term of sale imposed upon them by the tobacco industry. Failure to produce still associated with indolence, looms large above every farmer. The fear is mapped on to immigrants laborers, who exemplify uncleanliness and carelessness for the farmers and who are capable of making bad the crop harvested (Benson 2008).

**History of Networks**

This historical sketch is an attempt to relate the nature of tobacco and its cultivation to larger geographical and historical movement, especially within United States. In two parts of the chapter, I illustrate how the cultivation of the plant, the demand and pricing of the crop has organized the lives of people dependent on it. Moreover, the chapter traces out how forms and agents of surveillance over farmers and farming, whether it is internally among farmers or as outside forces, have changed over time. The next chapter illustrates how some of these changes influenced the consumers smoking on the other end of the tobacco ecosystem. More importantly, this
chapter testifies to the changing historical actors that is absent in the Latourian Actor-Network-Theory analysis. Latour’s ANT maps out networks formed by institution, people, and things, without drawing out social from material, to illustrate the nature of society. However, his analysis is bound often by an institutional space; say the laboratory, or time, comparing three different time frames of laboratory activities. (Latour 1987). I have tried to avoid this kind of framing of networks but extend it across time and space by fixing only one of the objects, tobacco, as a node in the network. In some sense, this claim itself is ironic for tobacco never is the same thing in different places, expect for being signified so.

The confluence of soil type, plant type, weather, demographic changes, mercantilism, and colonialism changed the way people perceived themselves, or the symbolic and moral realm if you will. The hierarchical nature of the settlement and the morality of discipline were highly influenced by the fragility of the plant and the labor required maintaining it. Indentured labor, tenancy and slavery were outcomes of this requirement. Here, I am not drawing the conclusion that tobacco alone was the only prime causal factor. On the other hand, one only tries to point to the constraint provided by a thing among others. Moreover, flow of materials in the form of hogsheads and English goods also maintained the social hierarchy in many ways. The moral realm of Chesapeake further influenced the kind of society formed in new

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7 In fact, if one considers the roles played by Thomas Jefferson and George Washington, who were part of the tobacco gentry, in shaping U.S as a nation-state the influence of the tobacco culture can be surmised to be more widespread. It influenced the nature of the British colonialism and position of the Crown in several ways.
frontiers such as Piedmont. The accidental rise of flue curing\(^8\) that revolutionized cultivation and consumption, the rise of cigarettes during the Depression only suggests the need to integrate non-human agency along with human agency, all the while reminding oneself the need for humility of humans more than things. The more things constrain and shape, the more they are unacknowledged. I am here illustrating this very humility of things as a way of moving away (or at least dumb down) from the overemphasis of rationality, will, intentionality, and choice among human actor (Miller 2005, 37).

\(^8\) Flue curing, the process of drying tobacco leaves, is vital to the history of cigarette for it fundamentally changed the chemical composition of tobacco that made it a good choice for cigarettes. This aspect is discussed in the next chapter.
The Becoming of the “American icon” in the Twentieth Century

This section details some of the changes brought about in the design of cigarettes that contributed simultaneously to its popularity and lethality. The origin of the use of tobacco wrapped in paper is traced to several sources. Some contend it originated in the Central and South America and was passed on to the Spanish settlers in 17th century, who smoked tobacco wrapped in vegetable matter and cornhusks. Others believe it came from the Turks to the British soldiers, during the Crimean War, while others attribute it to the lower class and urban young in Europe, who smoked leftovers of cigar tobacco in paper (Rogozinski, 1990 in Goodman 1993, 97). Unlike cigarettes, tobacco plugs, cigars and pipes, and snuff were well-known forms of tobacco consumption in the nineteenth century. While cigars were the symbols of “social authority and power” (Brandt 2007, 25), cigarettes were inexpensive, considered the pastime of the underclass, and started receiving credence among consumers only during the economic depression of 1873 (26). The gradual prominence of and shift towards cigarettes were marked by a moral disdain by legislators, cigar manufacturers, and other tobacco consumers. It was a habit for the “sissies and dandies” (Proctor 2011, 211), a “dirty habit” practiced by “disreputable men (boys)”¹ (Brandt 2007, 45).

¹ The initial advertising campaigns organized by James Duke Buchanan, who “almost single-handedly invented the modern cigarette” (Brandt 2007, 26), were directed at adolescents and young men.
The Chemistry of Addiction

Cigarette’s popularity coincided with many events, established and occurring, in first few decades of the twentieth century. Few of these, like flue curing and the increased production of Bright/Virginia tobacco, were mentioned in the earlier section. However, the mechanization of the production of cigarettes, the invention of matches and lighters, the aggressive marketing of the “American blend”, and its packaging made cigarettes a cheap, popular and portable consumer good. The Bright tobacco, grown in the sandy soil of piedmont, required fewer nutrients and gained a higher price. The sandy soil ensured a more homogenous tobacco harvest that was essential to cigarette production. Flue curing, on the other hand, made the tobacco lighter, the smoke milder and more inhalable apart from making curing a more uniform and less accident-prone activity (Proctor 2011; Brandt 2007; Goodman 1993).

Inhalability, which is a part of the chemical composition of tobacco, is vital to the preference for and addictive nature of cigarettes. These factors, among others, made tobacco more acidic. Acidic nature of inhaled smoke meant that inhalation of smoke was easier as opposed to cigars, whose smoke remained in the mouth due to its alkalinity. This quality also meant absorption occurred in the lungs as opposed to buccal mucosa (lining inside the mouth), the shortest and the fastest route to the brain. The presence of sugar in tobacco, which is particularly high for flue-cured Bright tobacco, also contributed to the acidic nature and easy inhalation of tobacco smoke. The starch present in green tobacco is converted into sugar during the flue-curing process. The curing process that alternates between low temperature with high
humidity and high temperature is effective in deactivating enzymes that breakdown sugar. Thus, unlike dark the aromatic tobacco used in plugs and cigars, light tobacco is absorbed directly by the alveoli present in the lungs. The functionary morphology of lungs with its large surface area and capacity to transport blood into the brain made for the shortest and the fastest route for delivery of nicotine (Proctor 2011, 33; Goodman 1993, 5-6).

Nicotine, which is the addictive substance in tobacco, is an alkaloid compound. Its structural similarity to acetylcholine, a vital neurotransmitter, acts to bridge stimuli gaps in neurons. This interactive relation releases other nerve transmitters such as norepinephrine, epinephrine, serotonin and dopamine. Some of these neurotransmitters act as hallucinogens with physiological and psychological effect, including change in pulse rates, blood pressure to feelings of well-being, alertness and arousal. This chemical feature of nicotine has been and is the selling point of the consumer product. The addictive quality of the product, in turn, assures a devoted clientele. However, nicotine in a free state requires particulate matter in tobacco smoke to convey itself. Minute droplets of nicotine are chemically unstable and require to be suspended in the tar element of the tobacco smoke to enter the oral cavity. The chemical nature of nicotine made tar an imperative element of cigarette smoke, which is carcinogenic in its constitution² (Proctor 2011; Goodman 1993).

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² Tobacco smoke consists of two phases, gaseous and particulate. Both these phases have carcinogenic compounds present within it such as carbon monoxide, ammonia, nitrogen oxide, formaldehyde, benzene, phenol, naphthalene, cadmium. These compound if not carcinogenic in itself combines at high temperatures with other compounds to produce carcinogens (Goodman 1993, 6)
Industrial Symbiosis

Mechanization of cigarette production is a part of the industrialization of the United States, which started in 1812 and developed with the invention of machines. Manufacturing of cigarettes started in the aftermath of the Civil War but its real popularity was spurred by the economic depression of 1873. Many of the cigarette manufacturers that existed in this period employed rollers. The arrival of James Duke, the heir of Bull Durham, in the 1880s into the cigarette manufacturing can be marked as the beginning of aggressive competition and solicitation of new smokers, and of the system of industrial organization. His strategic and exclusive contract with the James Bonsack, the inventor of the Bonsack machine, and the later buyout assured a competitive edge to Duke along with a mechanism for mass production. The process in James Bonsack’s father’s woolen mill inspired the making of the Bonsack machine. Duke’s entrepreneurial skill and disregard for traditions, which retarded the growth of other manufacturers, assured not only the creation of his empire but also of the rise of cigarettes. As mentioned in the last section, his method of industrial organization via management and consolidation of the supply chain worked a long way to make 20th century also the cigarette century (Brandt, The Cigarette Century: The Rise, Fall, and Deadly Persistence of the Product That Defined America 2007). In 1885, Bonsack machine could produce 210 per minute, almost as much as a hand roller could produce in an hour. This effectively reduced the cost of labor within production that in turn reduced the cost of consumption (Brandt 2007; Proctor 2011).

The mass production of cigarettes through machines combined with other
technological innovations gave rise to a symbiotic network of many industries, employed to add parts or accompaniments to the cigarette. The popularity of cigarettes rested upon its qualitative attributes of being cheap and portable. It required none of the paraphernalia required of cigars, snuff and plugs (pipes, cleaning devices, spittoons, collective spaces). Moreover, spitting and staining by this time had become increasingly unaesthetic. Cigarette smoking allowed for mobility, visibility in public sphere, and for people to punctuate time within the time and space of work and sociality. These qualities of cigarettes were cultivated within the symbiotic relationship of the tobacco industry with packaging and paper industries. Companies and research institutes working on flavors, additives and matches combined with this existing conglomerate. Packing machines were invented to keep up with the rollers. By 1980s, R.J Reynolds had machines that packed up to 205 twenty pack per minute (Proctor 2011, 41). Packaging of cigarettes in paper/ cardboard made packs compact enough to be carried around in pockets. The earlier packaging that was less sturdy was strengthened by inserting cards into the packages. These cards were profitably used by Duke to advertise pictures of sports persons, film stars and scantily dressed women to youngsters. For many, these cards became a collector’s item. The packs themselves were used as advertising spaces highlighting brand names, hues and symbols. Portable fire in the form of matchboxes came through as late as 1844 and took another 45 years to be put into boxes. Liquid-fuel lighter came into the picture by the 20th century, soon to become a form of technological art, illustrated best by the fashionable, windproof, small sized Zippo lighters (36-37). These factors combined to make the act of smoking a mobile, individual and public habit. The tobacco industry’s
aggressive advertising combined with these factors to make tobacco an important part of social interaction, while emphasizing individual’s freedom from authority and the right to choose. They received more than ample aid from urban industrialization, rising consumerism and wars in ensuring success for their products.

**Tasty Design**

The use of paper and additive flavors revolutionized cigarette smoking, making it a pleasurable experience, akin to consuming candy. However, these aspects of cigarette design have come under much scrutiny in the latter half of the 20th century. Paper design has varied throughout the twentieth to make it easily combustible and yet stiff. The addition of inks and stiffening material made paper the first suspect carcinogen in cigarettes. One of the major reasons for the indiscriminate addition of flavors was the position of tobacco beyond the reach of many regulatory frameworks. Cigarettes fell out of the purview of Food and Drug Administration Act of 1908 as it was neither food nor drug. Moreover, popular belief regarding purifying qualities of fire and the fact that cigarettes were never ingested added to the lapse in regulation. The history of tobacco is also the history of its shift as a material category, from herbal panacea to cash crop to recreational consumer product to a drug. This movement in the 20th century is not so much linear as much a slipping in and out of one or the other category depending on the specific discursive realm. The categorization of tobacco was never an arbitrary or apolitical event. Starting with James Duke to Philip Morris

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3 The long-standing relationship between paper manufacturing company, Ecusta Paper Corporation, and tobacco industry is discussed in the later section. Some of the first internal science studies were conducted in this company (Proctor 2011, Chp. 14)
in the 21st CE has all worked hard to prevent tobacco’s entry into regulatory categories of drugs and carcinogens. The inability to categorize tobacco as either drug or food or as an essential crop has allowed it to escape any serious regulation for more than a century. Thus, the addition of flavors, known as volatile and non-volatile, by the industry have altered significantly in the last century. They have varied across time and across countries in accordance to regulations present in the specific country or in accordance with research on carcinogenic nature of additives (Purkis, Mueller and Intorp 2011). Everything from cocoa, licorice, sugar, maple syrup, menthol to artificial flavor and aroma additives has been added to cigarettes. The long-standing relationship between sugar, licorice and tobacco is well-documented. In fact, by the early twentieth century tobacco industry owned most of the production of licorice in the United States (Proctor 2011).

Apart from food additives and aromas, tobacco also contains residues from chemical fertilizers, fungicides and humectants, which have ranged from acrolein and charcoal to lead, asbestos and arsenic. The addition of flavors, aromas and non-volatile compounds (mixed with the blend) such as cocoa and licorice have been justified based on their quantities and its presence in ingestible food items. However, in the case of cigarettes these compounds are combusted at a high temperature and often intermingle in the process to form other chemical reactants. Sugar in the form of mono- and polysaccharides, added in tobacco, upon pyrolysis caramelizes into acids and aldehydes that in turn react with amines present in tobacco to form highly carcinogenous substances like aliphatic aldehydes, acetone and acrolein. This
chemical reaction also makes sugar a “pro-addictive” substance (Talhout, Opperhuizen and Amsterdam 2006, 1791). That is, it makes tobacco sweeter, inhalable and less harsh. This combination is perfect for beginners who are often youngsters (1791-1796). The slogan “Reach for a Lucky instead of Sweet” by Lucky Strikes seems less ironic in the light of this discovery.

**Situated Design**

These changes in the manufacture and design of cigarettes coincided with the more general changes in the American society. The mechanization of industries, the movement of populations to urban places, the assembly line nature of factory work, the laissez-faire market, the rise of liberal individualism, and finally, the Great War that worked toward the rise of cigarette consumption. The War, especially, forced classes of men to interact with one another under the aegis of a nation and worked a long way to the spread of cigarette smoking. Cigarettes, themselves, carried some of the traits that contributed to its popularity. This form of tobacco consumption was conducive for workers in factories and for soldiers in the trenches. Thus, Brandt claims, “cigarettes were the “modern” tobacco for the “modern war”” (2007, 53). It possessed the consistency of quality and was affordable. These facets of cigarettes allowed for its consumption across classes. Moreover, tobacco industry’s campaigns captured this turn of events, and, touted nationalism and equality in their homogeneous mechanized products. The subtle difference in products - branding,

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4 Industrialization in the United States began in the early 19th Century but its rapid growth occurred with the mobilization of steam-powered industries in the latter half of the century.

5 Laissez-faire policies also have an irregular history in United States but its establishment can be dated to the years after World War I and the Depression.
blend, flavors and colors became the metaphor of individual preference/difference in an egalitarian society (56-57). Thus, cigarettes were not only a symbol of equality and nationalist prides but also of individualism. The consistency, packaging and long-shelf life made it a favorite among taxation agencies, whose long-standing friendship with tobacco last until today.

Thus, the nature of tobacco and the design of cigarettes, as an artifact, have contributed to its lethal nature. I contend with Proctor (2011) that significant changes made to the very act of consuming tobacco resulted in the prevalence of new forms of diseases, such as lung cancer. Minute, often microscopic, changes were added and substracted over the years in the light of newer and newer research findings. Cigarettes revolutionized the culture of smoking in the United States displacing the earlier American preference for chewing tobacco, which constituted 44% of consumption as late 1900. A 60-fold increase in cigarettes consumption from 1900 occurred only in the aftermath of World War II (92).

Jain (2006) tries to illustrate the changing nature of consumer products in the introduction to her book through the notion of design. Design constantly re-defines the point of interaction between human bodies and non-human objects, all the while assuming an average rational human. The author claims that in the case of United States, this assumption in design takes its cues from injury laws, which create precedence for a specific language to address this relationship. Here, Latour’s (2000) claim that roles assigned to material things such as mediator and intermediary of

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6 I have deviated from the terms non-human and things to artifact in this case only to highlight the human intervention
intentions or social relation fall short of explaining how solidity, fragility and form of the things itself creates constraints rings true (18-20). The human design of cigarettes, often than not, were not intended at killing the consumer but rather the confluence of profit, chemistry of tobacco and design of cigarettes together contributed to the lethality via specific diseases. The material form of tobacco is not divorced from the socio-cultural or geographical vectors but creates it while creating itself out of it. The “tar derby” of the 50s and 60s and the Surgeon General’s Report series on “The Changing Cigarettes” in 1981 indexes these possibilities (discussed in later sections). In this sense, there is a further possibility that the science of yesterday did not see what it sees today because the object (or Reality) had not come into existence in that form prior hand.
This chapter takes account of the scientific studies on tobacco that was undertaken in the mid-twentieth century. The section illustrates the processes through which a scientific “community” studying the effects of tobacco materialized around the potential lethality of the thing. The reasons for its rise at a particular historical juncture in a particular geographical space are not so much the result of cumulative progress internal to science. Science, one will see, takes its cues from the outside world and is a fluid realm that becomes concrete around certain issues. These issues can range from rise of certain diseases and consumer capitalism, the ethics of tort laws and ethical concerns of scientific practice to epistemological shifts occurring within science. In fact, the epistemological concerns themselves are a reflection of the changing behavioral patterns and concerns and the rise of new diseases. More importantly, it shows science to be a politically situated entity distinct from the ideal upheld by philosophy of science and scientists. The resurgence of studies on tobacco had a lot to do not only with shifts in epistemology and disease patterns; but, it was also influenced by the politics of geography and the kinds of lives that were affected by these historical changes. The existence of torts laws and an increased perception of risk from consumer goods in the United States have allowed for certain discourses to thrive. This essentially did not result in a ban as much as movement of production and consumption into the developing world, which did not share the same concerns over consumer health or risk For these reasons, a eulogy of the universal rationality of
science is untenable. Lastly, the science of tobacco depended on the emergence of a material object, which was designed so that its proper use killed its consumer.

In this chapter, I take Latour’s cue that science is a Janus-faced entity consisting of, on the one hand, already existing black boxes of facts and, on the other, uncertainty of science in the making. A controversy exists when a fact is still qualified and unsettles established scientific facts leading to the re-opening of a black box. In this case, the re-opening of the black box involves unsettling the existing paradigm of laboratory and experimental science by epidemiology. The unsettling obstructs existing processes, which include the situation of scientist as a singular entity within laboratories, the legitimate object used for such studies (microscopes, slides, in vitro experiments), and the accepted epistemological paradigm of disease entities. The rise of certain kinds of diseases such as lung cancer and heart diseases required a radical shift in epistemology that in turn shifted the nature of experiments conducted and tools used thereof. Thus, controversy involves a shifting of gears based on new facts that then entails a collective process of construction of fact and tools (Latour 1987, 2-4, 22-29). The construction here is not to point out a farce as much as the construction of artifact, the scientific fact, in an objective fashion. As Latour claims, it is much like the construction of a building or artwork. It provides one with a glimpse of the coming into existence of the thing by adding to it a time dimension, all the while reminding us “things could be different” (Latour 2005, 89). This chapter studies this process of construction as a historically situated one that required not only science but also public health, law and pressure from the industry.
A study of scientific studies is important to understand the difference in qualitative understanding of tobacco from other realms, say, agriculture and consumption in science studies. It also attests to how repeated scientific confirmation resulted in establishing carcinogenic nature of tobacco as one of its fundamental facets over and above other qualities. In tandem with public health and law, science made visible this quality, which in turn affected public understanding of smoking and smokers as well as agricultural practices (See Benson 2012)

**The Early Signs of Trouble**

The awareness of the toxic and addictive nature of nicotine in distilled tobacco existed as early as the late 16\textsuperscript{th} century, though the knowledge of its chemical structure as an alkaloid with affinities to opium and heroin occurred only by the 19\textsuperscript{th} century (Proctor 2011, 27). As early as 1890 in Vienna, Anton Bosch studied origin of cancers using tobacco in *in vitro* studies\textsuperscript{1} (150). Anti-tobacco campaigns also existed as early as or earlier than cigarettes. The drawback of earlier scientific studies was the usage of a certain language that did not separate the moral implications of smoking from its physical and medical effects\textsuperscript{2}. Furthermore, the problem of individual variation, the inability to predict causality or measure moderation, and the increasing popularity of smoking amongst the public laid to rest any further dictates or concerns regarding smoking. Lastly, the War where young men were sacrificing their lives to the national

\textsuperscript{1} drawing from Hermann Tillman’s classification of tobacco as a “well-known carcinogens”

\textsuperscript{2} Thus, while scientific studies existed, they were either dispersed individual efforts or morally anachronistic. Several studies on the effects of nicotine on motherhood, health of the newborn, and lactation as well as on the generic dangers of smoking existed during this time, but they either used moral rhetoric or steered clear of strong judgments owing to the popularity of cigarettes. Most effective forms of deterrence were individual doctors who cautioned their patients and proposed moderation.
cause made anti-tobacco campaigns seem petty, anachronistic, and delivering tobacco to soldiers an act of patriotism (Brandt 2007, 51-54; Proctor 2011, 44-48).

Similarly, anti-tobacco campaigns, though ahead of time in terms of their demands for the rights of non-smokers and regulation of environment, were anachronistic\(^3\) in its logic of loss of Puritan values of self-abnegation and austerity and Victorian sensibilities concerning pleasures, restraint and the role of women as upholders of value. Smoking in the early 20\(^{th}\) century anti-tobacco campaigns were mostly associated with moral degeneracy, criminal and juvenile deviance, and promiscuity\(^4\) (Brandt 2007). The early campaigns and moral policing only worked to increase the popularity of cigarettes, especially as a form of rebellion. The use of lit cigarettes, compared to the torch of freedom (Tobacco Wars, Part 1\(^5\)), in women’s rights movement is testimony to this form of rebellion. The disregard for youth smoking habits and the severe moral policing of women’s smoking made cigarettes an icon of change and rebellion in an increasingly individualistic, urban and consumerist society.

Apart from the rising popularity of cigarettes and anachronistic discourses of interest groups there were other reasons for the late resurgence of studies on tobacco consumption. Firstly, there was a preference within the English and American sciences

\(^3\) Atleast with respect to youth, especially young women

\(^4\) Lucy Gaston Page and Henry Ford’s (*The Case Against the Little White Slaver*) (46-47) well known campaigns directed its opposition to the “vulgarity of smoking” and to smokers. However, though few moderates worked amidst these claims, the effective result of the campaigns and legislation (by many states in the early decades of 20\(^{th}\) century) effectively created a gap between them and the rising urban youth population and women (46, 47, 60-62).

\(^5\) [http://www.tobacco.org/News/9910tobaccowars.html](http://www.tobacco.org/News/9910tobaccowars.html)
among regulatory bodies, scientific community and the industry. Secondly, political amnesia and guilt by association meant the loss of the early watershed in tobacco studies in the Nazi Germany. Thirdly, some works, such as statistical studies done in the early 1920s and 30s did not carry much weight due to the incipient nature of epidemiology. Several of Third Reich’s senior health officials like Leonardo Conti, Reich Health Führer, Karl Astel, president of the University of Jena and Adolf Hitler condemned smoking. Astel called smoking “filthy and unpatriotic” and “the gymnastic apparatus of the weak-willed” (163), and Hitler claimed tobacco was “the vengeance of the Red Man against the Whites, revenge for having been given hard liquor” (163). Other works, such as that of Mühlbock did not gain publicity as it was written in Dutch. Another important scientist, whose work influenced several of the later scientists, was Angel Honorio Roffo in Argentina. He spent his life studying the effects of tobacco using chemical and statistical studies, animal experiments on different species of mammals, chemical analysis using spectrography and distillation to prove the carcinogenic effects of tobacco. He, further, bolstered his life-long project with presumptive arguments on the pertinence of sexual difference of cancer patients between the period of 1920 and 1940. He linked cancer to smoking by using the analogy of “smoking street” (155), indicating the prevalence of cancer of the lip, tongue, mouth, bronchial and lungs among smokers and males as opposed to non-smokers and females. More importantly, he identified benzopyrene, a polycyclic aromatic hydrocarbon in tar, as a major carcinogen in cigarettes more lethal than the inorganic constituents and nicotine alkaloids (Proctor 2011, 155-57; Brandt 2007, 6)

6 Female smokers were still a significant minority in the early decades of the twentieth century.
The industry tried to stifle and ridiculed Roffo’s works, especially for his use of crude techniques and lab animals like rabbits to study a human disease. Lastly, the existing scientific paradigms such as experimental studies within laboratories, based on Robert Koch’s principles of etiology (discussed later), and the rising tide of genetics effectively suppressed early studies on smoking. The structure of scientific practices, such as technical boundaries of the laboratory and the existing paradigm among scientists also played a significant role in maintaining the dispersed and unorganized nature of these findings.

Resurgence of Scientific Studies of Tobacco: A Paradigm Shift?

The scientific studies determining the dangers of tobacco resurfaced in the 1940s because of many factors, some of which are similar to the reasons for the rise of cigarettes. Increase in prosperity and consumptive capacities of industrial societies are two such factors. The United States had stabilized from the debilitating effects of Great Depression by the end of World War II that in turn saw the end of Prohibition and the rapid rise in consumption. The advances in medical technology and improvement in quality of life and life expectancy diverted attention from concerns pertaining to infectious diseases. However, inherent in this progress and prosperity was their potential failure and this was a shift in the patterns of diseases, especially, the sudden increase of cancer during the 1940s. At the turn of the century, cases of cancer reported were approximately 400, but by 1945, this number rose to 11,000 (Brandt 1990, 161). Medical professionals now shifted their gaze to chronic, non-communicable diseases that were becoming the norm of modern capitalism and its
consumptive patterns. These ailments were peculiar in their nature in that they had long latency periods and multivariate causality; moreover, they were, until then, the diseases of the old. These “diseases of civilization” (Golan 2012, 165) were no match for the prevalent paradigm of experimental methods of ascertaining causation. According to Proctor (2011) the link between tobacco and chronic diseases were not so much novel as the result of an increased focus on cancers, especially of lethal ones such as of the lungs.

Moreover, injury laws\(^7\) \(^8\) and the predominance of insurance industry played a vital role in relationship between individual behavior and choices and perceptions of risk. Their location in American society, which differed from their British counterparts, was also a testimony of high health care costs, corporate lobbying and influence, “political suasion” of regulatory organs of the state, and the *laissez-faire* market of capitalism (Jain 2006, 1-3). The preoccupation with cancer and smoking, as opposed to heart diseases, can be seen in the light of liability suits. Heart diseases killed more people but its tendency to be affected by multiple causal factors made pinpointing culpability to tobacco alone an arduous task (Proctor 2011, 225). It then comes as no surprise that Frederick Hoffmann, a statistician at Prudential, was one of the earliest to provide a “comprehensive analysis of the evidence of smoking as a cause of cancer in 1931” (Brandt 2007, 124-5). His study was devoted to understanding behavior, risk of disease and measurements of risk. These aspects were definitive concerns of the life insurance industry, which grew in the first half of the

\(^7\) It works as an emotional witness to injured morals and allowed for expression of anxieties that arises from increasingly consumption-oriented societies (Jain 2006)

\(^8\) Discussed later in the paper
twentieth century and played an important role in the creation of the “American subject”.

Thus assessing the rise of epidemiology and scientific uncertainty is in some sense addressing a non-cumulative epistemological paradigm shift within science (Kuhn 1996). However, the threshold of the paradigm shift depended on increase in cancers in prosperous countries (Proctor 2011, 151). It became a matter of concern with the loss of productive citizens as opposed to the elderly (152). Alternatively, the history of tobacco studies also shows an apparent cumulative effect of scientific progress, or an accumulation of anomalies, within science. The cumulative effect is illustrated in the rise of epidemiology indexed a lacuna within science itself. The effect will be further illustrated in the later sections not as internal to science as to the relationship of science to public health, law and corporates. It is sufficient at this point to remind oneself that corporates and political agenda, activist organizations and regulatory organs, and law played a huge role in formation of a scientific controversy that later codified into new ethics of scientific research and new epistemology of diseases. It took a few decade and countless dead bodies for it to happen. Furthermore, the task of finding a causative agent was as important to scientific studies as for determining liability and injury in litigation.
History within History: The Rising Voice of Scientists Studying the Effect of Tobacco and Cancer

The following two sections look at the specific scientific studies and “causal conundrum” (Brandt 2007, Chapter 5) that mobilized a real change within the scientific community and in the public perception of smoking. This section details some of the prominent studies on the effect of smoking and their major concerns. Concerns, such as mobile nature of smoking and significant difference in styles of smokers, varying levels of exposure and the inability to measure intake, the problems of “recall bias” and investigator’s bias, and the inability to pinpoint a mono-causal etiology existed from the outset. These problems were problems of methodology and epistemology but were effectively used by interested parties (industry, dissenters and critics) to undermine scientific findings on tobacco.

The sporadic rise of lung cancer cases and its prevalence among smokers first came to the attention of physicians treating patients. In the 1920s, according to Proctor (2011), one saw the rise of such case studies in Europe and United States (152). Alton Oschner in New Orleans and Richard Overholt in Boston were chest surgeons who made this connection. Their work, though displayed the limited scope of clinical observation, were influential to the work of Graham and Wynder. In 1950, Journal of American Medical Association published the work by Ernst Wynder and Dr. Evarts

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9 Raymond Pearl in 1938 at Johns Hopkins had already come up with the first significant statistical analysis of the health impact of smoking and increased mortality among smokers, and the importance of dosage in studying prevalence of cancer.
10 Wynder-Graham and Doll-Hill studies are considered watershed in scientific study of the ill effects of tobacco, though Roffo had German scientists had already covered this ground. Their importance is for the caution they exercised in devising method, having learnt from earlier forays.
Their study was meticulous in its methodology; fully aware of its limitation, they made a cautionary remark that smoking was etiological cause for cancer but not the only one. They also coined the terms “light” and “chain” smoking to mark dosage and exposure, which differed from earlier conception of moderation, and recorded the corresponding types of tobacco usage among cancer patients (132). The presumptive analysis of the sexes and sale of cigarettes corresponded with the resulting data, which showed an increased prevalence of lung cancer, within decades of the rise of cigarettes, among men. They further corroborated their work by animal experiments along with Croninger in 1953 (Proctor 2011, 226).

During this period, Bradford Doll and Richard Hill, whose work were published in British Journal of Medicine four months after Wynder-Graham paper, investigated systematic statistical evidence and experimental studies to illuminate the relation of smoking to cancer. They compared lung cancer patients with healthy patients, smokers with non-smokers, and women to men. The problem of “recall bias” and bias of the scientists was a plaguing issue in retrospective studies. These scientists meticulously used randomized and anonymous interviews to avoid unintentional bias (Brandt 1990, 138-141; Proctor 2011, 227,231). They also corroborated their findings with histologies of patients affected lungs (br 141), chemical studies (by Doll in 1955, Proctor 2011, 340).

Persistent criticisms from different directions forced Doll and Hill, who apart

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11 Their study of 604 cancer patients across the country and control cases concluded that smokers had a higher chance of contracting cancer, or bronchogenic carcinoma (Brandt 1990, 133).
from their dedication to tobacco were committed to demonstrating the power of epidemiological method, to plan a strategic study in 1951. This study attempted at combating issues of retrospective studies through prospective/cohort method combined with randomized trials and control groups. Their work followed British physicians, separating them into two groups. The groups were similar in every respect except for the intervention of cigarettes in one group. The result showed a 24 times increase in death rates among doctors who smoked as opposed to their counterparts (Brandt 2007, 144). Cuyler E. Hammond and Horn, psychologists and skeptics of retrospective studies, took up further prospective studies of 200,000 men between ages of fifty and sixty for four years. During this period, 12,000 died. Lung cancer was prevalent cause of death along with heart and circulatory disorder (145). They also brought back a revised version of the old “tobacco heart” (146).

These studies differed greatly from the perception of the scientist as a lone crusader working hard in his laboratory to devise solutions to problems of disease. On the contrary, they investigated diseases *in situ* and often in allegiance with other scientists. Though the Wynder-Graham and Doll-Hill studies are considered watershed in the realm of epidemiology and tobacco-related diseases, they were not stand-alone or definitive study. The concerted effort of scientific community using “methodological reinforcement” (Proctor 2011, 231), no thanks to the persistent disparaging efforts of the tobacco industry, produced a cumulative effect that pushed the threshold of understanding diseases\(^\text{12}\).  

\(^{\text{12}}\) These works were also corroborated by studies in clinical pathological study of lung tissue
An Interlude into Epistemology: Scientific Uncertainty, Problem of Causation and the Rise of Epidemiology

The problem of scientific uncertainty, which was repeatedly touted by the industry and plagued epidemiologists and statisticians, is an epistemological question on the issue of causality. The “epistemological foundations of biomedicine” (Brandt 1990, 138-141) was revolutionized as the result of this shift to epidemiology; enabling it to address the historical shift in American lifestyle in the post WWII and the increase in new kinds of diseases.

The history of epidemiology bespeaks of the circularity or role of repetition in history. During the 17th and 18th century, in the wake of several epidemics such as small pox and yellow fever, inoculations and miasma theory of diseases, with its theory of “foul emanations” (Susser 1991, 639) and concepts of multivariate causality, worked with great success in containing them (Schoenbach and Rosamond 1999, 271). The notion of causality was further modified with the work of John Snow and William Budd on cholera and typhoid that specified the nature of the -cause to a single agent or “specific transmissible pathogens” (Susser 1991, 640). Louis Pasteur’s germ theory supporting the identifiable nature of microorganisms identifiable, and Koch’s work on tubercle bacillus in 1882 fortified the single-cause-single-effect ideal into the Koch-Henle postulates. Causality shifted to a single agent, which was directly observable, specific, predictable and discernible, causing a single effect. Diseases, as and the effect of substance such as carbon monoxide, ammonia and aldehyde on lung tissue (Proctor 228-29)
well as their causal agents thus became specific, discrete entities that could be observed under a microscope in a laboratory (Schoenbach and Rosamond 1999, 271). Its fundamental benefits were that it was precise and replicable (Brandt 2007, 124). It had fundamental influence on spatial categories within scientific practice. The clinical laboratory became an ideal site to observe, identify, and isolate microorganisms, which were then grown in culture and utilized to make vaccines/drugs (119). The human body was a bounded entity that was recipient, home and playground for the actions of these microorganisms. These postulates were to govern medicine for three quarters of a century. It further emphasized visual perception as the foundation of scientific knowledge, exemplified in instruments such as microscopes. The theory shifted perspective from environment and behavior to the laboratory.

In the 1950s, the decrease in infectious diseases led to the replacement in microbiology of concerns from pathology and etiology to genetics and biochemistry.

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13 The postulates did come up against barriers in microbial diseases of endogenous origins and in viral infections (Schoenbach and Rosamond 1999, 272) but its success undermined any anomaly until the middle of the twentieth century, when infectious diseases subsided and chronic diseases rose. Its hold on causality remains as epidemiologist struggle to look for single causal risk factors.

14 The tobacco industry later rewarded or incorporated some of these critics into their fold. Joseph Berkson, a biostatistician at Mayo Clinic, was one of the early critics who evoked the lack of specificity as one of the main opposition to the studies (Brandt 1990, 142-143; Susser 1991, 640). The idea that a single cause could result in multiple effects was incongruent with his *apriori* commitment to specificity. R.A Fisher, whose statistical devices were used by Doll and Hill and Hammond and Horn, was a biostatistician and the chair in Genetics at the Cambridge University. He used symmetry, genetics and idea of pre-disposition to attack the development of lung cancer among tobacco-smokers. That is, if smoking causes lung cancer then it was equally possible, according to Fisher, for people susceptible to lung cancer or in pre-cancerous stages to have a pre-disposition to smoking; a pre-cancerous inflammation causing irritation could overlap with emotional irritation to create a pre-disposition to smoke (Stolley, 1991, 419-23). Similarly, Wilhelm Hueper, director of the Environmental Cancer section of the National Cancer Institute expressed similar reservation and blamed pollution as the cause of cancer (210). Hueper’s dissent proved very useful to the tobacco industry as he was a leading authority on occupational carcinogens but he, unlike the rest, was also well aware of the consequence of corporate neglect and malfeasance and did not align himself with the industry. C. C Little, on the other hand, a fanatic experimental geneticist who
It then comes as no surprise that the main resistance to epidemiology came from geneticists, experimental scientists, and bio-statisticians interested in abstract concerns as opposed to pragmatic ones. The pragmatic function of epidemiology within public health created rift within epidemiology itself. The structured mathematical responses of formal statistics were opposed to the unstructured queries that a field practitioner faced. The movement from statistical inference to causal inference, from causal inference to perception of risk, and from risk to pragmatic policies further embroiled the nascent epidemiologists in heated epistemic debates, which could not be disentangled from larger socio-political questions of freedom. The resolution of issues such as these, illustrated throughout the history of epidemiology, often resorted to opportune results of practice or to legal, public health and other agencies outside of the field of science (Susser 1977).

Epidemiologists have traditionally skirted the issue of defining causality with qualifying statements on causality (single, multiple, necessary, direct etc.) or questions of research designs and problems of exposure and risks (Susser 1977, 636). The move from association to causality and etiology involved causal inference of case-specific studies. It effectively entailed extrapolation and speculation, which ran the risk of missing other determinants as well as exaggerating a plausible determinant. However, epidemiology and the new causal logic attained significant legitimacy with the publication of 1964 Surgeon General’s Report, *Smoking and Health*. The report put opposed tobacco on the basis of genetics and pre-disposition tried to avert blame from tobacco to constitution of individual consumers. He would go on to lead the Scientific Advisory Board (SAB) of the Tobacco Industry Research Institute, until his claims lost all credence (Oreskes and Conway 2010, 17; Proctor 2011 267, 268).
forward a list of five “epidemiologic criteria for causality”, articulated by William Cochran, and Bradford Hill followed it with an elaboration. The Report’s criteria included time-order (temporality), strength, specificity, consistency, and coherence, and Hill added analogy, experiment, biological plausibility and biologic gradient to it (Susser 1991, 641; Schoenbach and Rosamond 1999, 279-282). According to Susser (1991), association, time-order and directionality were the *sin qua non* of epidemiology.

The setting of criteria signaled an acknowledgment of epidemiology as a scientific practice, but it also belied the inherent tendency towards caution within scientific community. Epidemiology is still lauded more for its usefulness, flexibility and conducive nature rather than for its truthfulness. Often than not, additional studies are required to fortify its claims, especially in the realm of litigation.

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16 The first criteria of time-order required that the exposure preceded the disease, invoking the notion of directionality and asymmetry between cause and effect. The second criterion was the strength of association that required cause and effect to occur simultaneously. Probability, proportionality of exposure to disease, and inverse proportionality of incidence in control were used to eliminate chance associations. Third criterion of specificity, or specificity of association, again invoked exposure rates as well as “signature diseases” (Golan 2012, 168) to identify relationship between cause and effect. Consistency was to be determined by replicating studies in different people, areas and periods to guard against artifact errors of association. Coherence used common sense and prior knowledge of the disease, exposure and experiments to iron out implausible associations. Hill’s criteria of analogy were a search for situations in the past similar to that of the cause and effect under scrutiny. Experiments were to reinforce existing studies with other studies as well as use of different method and designs. Biological plausibility assessed the association in term of possible relation between cause and effect within biological limits. Biological gradient sought to assess risk with increased exposure, also known as dose-response relationship.

17 Science issues cautionary principles to safeguard against human errors often to the disadvantage of individual scientists. The scientific community, in this case, particularly safeguarded against two type of errors. It was strict with Type 1 errors that are against touting a non-existent relationship between cause and effect, while it favorably bends towards Type 2 errors that suggested healthy skepticism, and pushed to avoid missing effects. Moreover, Ockham’s razor model of scientific theory, which requires parsimony and simplicity, is based solely upon evidence. This principle presides over the existing principles (Oreskes and Conway 2010, 157-58; Susser 1991, 643).
and regulatory policies. However, it found, as its history tells us, an undying ally in public health and regulatory bodies. This alliance by the mid-90s led to several regulatory measures against smoking while spreading awareness to the public, which in turn, led to several liability suits against the tobacco industry by users and secondhand users.
Getting their act together: Public Health, Regulatory Bodies, Science and Law

Public Health Regulation and Science

The concern among regulators over tobacco consumption started in the late 50s. The public health organizations until then were mainly concerned with vaccinations. The rise of chronic diseases as a result of consumer practices entailed regulating individual behavior, which was met with resistance within public health bodies. On the other hand, cigarettes had managed to remain unregulated since its advent and it would take years of negotiating before Federal Trade Commission could impose a ban on advertising of tobacco products in 1970. It took another two years for it to issue mandatory labels on all forms of advertising. The political clout and close monitoring of legislative procedures by the industry ensured that cigarettes fell out of the arms of most regulatory organs and into Federal oversight only (Brandt 2007).

The noise created by the industry and by significant new studies on tobacco in the 50s drew the attention of both public health and regulatory bodies, which now felt the need to look into the matter. In 1956, the Surgeon General organized a study group to assess the existing studies on the effect of tobacco. This group reached a consensus, even after studying contrary studies, of a positive connection between tobacco and a number of diseases. In 1962, Luther Terry, whose political savvy and leadership went

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1 The details of the influence of the tobacco industry and its political lobby, Tobacco Institute, deserve another paper in itself.
2 in collaboration with ACS (American Cancer Institute), AHA (American Heart Association), NCI (National Cancer Institute, and NHI (National Heart Institute)

The report gave veracity to the claims of epidemiologists as well as to public health organization at a time when more than 50% of the adult population in the United States smoked. The Report termed tobacco a habituation rather an addiction, an aspect which changed by the next Report. The position of the Surgeon General, from this time on changed to that of a public figure and authority on health-related matters. The wide acceptance of the Report, in spite of the industry’s strategies, mobilized scientists, grass-root organization and regulatory organs to work in concert. One of the main results were the use of the industry’s own strategies, such as public relations, advertising and “equal air time” against it. The consumer lawyer, John Banzhaf mobilized the movement for equal airtime, resulting in the fall of smoking in 1967. The industry, later, conceded to the ban on advertising to avoid airing of anti-tobacco advertisements. More importantly for this paper, it resulted in the rise of procedural science that set out standards for scientists, reiterating the need for further studies that corroborated their studies, peer-review, and wide dissemination. It also evoked caution of conflict of interests while maintaining integrity of scientific practice. It allowed the scientific community to portray a unified front now that a common enemy was identified, however incomplete. Furthermore, it mobilized numerous grass-root

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3 The commission had representatives who were smokers, non-smokers, and the tobacco industry whetted the candidates to avoid future controversy. The commission was discrete and methodical in their endeavors, established at the outside the criteria for judgment of causality. The Report was based on 7000 publications.

4 http://profiles.nlm.nih.gov/ps/retrieve/Narrative/NN/p-nid/60
organizations, such as GASP (Group Against Smoking and Pollution), which now fought on a local basis for non-smoker’s rights (Brandt 1991, 1998, 2007).

The 70s saw the logical leap from the dangers of cigarette smoking to that of the dangers of side stream smoke. If tobacco smoke, or mainstream smoke, was harmful to smokers then it was only logical that unfiltered side stream smoke was harmful to bystanders. Differently termed, with different social and cultural implications, as environmental tobacco smoke, passive smoke, second hand smoke, the effects of this was easier to prove and accept than its precursor. The 70s and 80s saw a number of anti-tobacco groups fighting for rights of the non-smoker to breathe uncontaminated air. The rise of single-issue groups such as GASP helped the movement, which ended in legislations against indoor smoking. In-flight smoking was the last to gain momentum and legislation in 1990 (Brandt 2007, 303). Nevertheless, by 1981, every state had some form of regulation, and employers, in an attempt to avoid liability, complied. The hazards of involuntary smoking were elaborated in 1986 Surgeon General’s Report (Brandt 2007; 1998).

5 The claim only reiterates the precedence set by the 1964 Report for such studies as well as their acceptance. In reality, SHS was a difficult task to prove in terms of exposure, dosage and controls. It took the longitudinal investigation of married women by Takeshi Hirayama in Japan and Dimitrio Trichopoulos in Athens to confirm the carcinogenicity of second hand smoke. Not to mention the resistance from the industry itself, since now smoking was not just an individual choice (Brandt 2007).

6 Mainstream smoke inhaled by the smoker passed through the body of the cigarette and cooled before entering the oral cavity, while sidestream smoke escaped from the burning tip of the cigarette into the atmosphere (Goodman 1993).

7 Environmental smoke was the termed initiated by the industry, which worked against them in the long run as it drew the attention of Environment Protection Agency (EPA). Passive smoke, on the other hand, had connotation of being an involuntary act, bringing about the notion of innocent victims. Secondhand smoke implied that someone else had already used the object under consideration (Brandt 1998, 2007).
Lillienfeld and Lillienfeld (1982), in their analysis of 19\textsuperscript{th} century epidemiology conclude that there are the four allies of epidemiology. They are quantitative reasoning, or “méthode numérique” (141), controls, which were the “the conceptual essence of observational and experimental epidemiology” (143), vital statistics, and finally, “the problem of hygiene and public health” (144). Historically statistical epidemiology has been the handmaiden of public health. This rings true of the tobacco controversy though it remains doubtful who served whom. The cognizance of health risks of tobacco by public health and regulatory bodies went a long way to establish the scientific studies of early decades of the 20\textsuperscript{th} century. Similarly, epidemiological studies of smoking and second hand smoke bolstered the case of regulatory legislation against tobacco use, especially in public spaces. Environmental agencies and grass-root activism added urgency to the matter.

\textbf{Law and Science}

The rise of mass tort litigation or toxic torts also resulted in an alliance, though it was much more tedious. Torts law since its inception has been the constant companion of consumer capitalism. It provides a platform for addressing the injuries to a person by products, and the negligence of the producer thereof, without questioning the inherent relationship of consumer capitalism to injury (Jain, Injury: The Politics of Product Design and Safety Law in the United States 2006). Tort law in the latter half of the century shifted from the personal victim to the “statistical victim” (Golan 2012, 164). This shift is traced to the range of environmental activism and product liability suits in the 1970s. People were increasingly subjected to homogeneous mass-produced products of consumption and environments, such as
work places (Golan 2012). Occupational hazards, environmental hazards, product liability became sources of injury and affected increasing masses.

Scientific evidence and expertise were prevalent in courts since World War II, but the use of epidemiological evidence marked the shift from personal injury to mass injury. The successful litigation against asbestos and synthetic hormone diethylstilbestol resulted in its firm position in the courts, which deferred to this form of scientific expertise. Epidemiology was a useful and flexible tool that studied cases post-facto in their natural habitat. It was less concerned with the “illusive biological mechanism” and used modern technology to study multivariate causality and regression to identify “risk factors”\(^8\) (165, 166). In this sense, it was a perfect fit for the “new web like universe of irreducible chronic health problems” (166).

However, its usefulness was restricted and this caused tension in the legal-public health-science nexus. Needless to mention, the affected corporate and industries abetted and fueled the existing tension. In spite of its constant self-improvement, epidemiology often could only provide correlation as opposed to a specific cause, which made proof of liability an arduous task. Correlations worked effectively in legal suits were the causal toxic substance, such as asbestos, caused “signature diseases”, such as mesthelioma (Golan 2012, 168), but not so much for effects which were more generic\(^9\). The famous Daubert Case (Merrell Dow Pharmaceutical v Daubert) in 1993 is illustrative of the drawbacks of epidemiology or “scientific uncertainty” (Michaels and Monforton 2005, Glantz and Ong 2001; Golan 2012). This quest for “signature

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\(^8\) The Surgeon general’s Report of 1964 used the phrase “risk” to avoid claims of etiology and causality (Brandt 1990, 164)

\(^9\) Probably one of the reasons, apart from scientific interest, for the excessive work on lung cancers as opposed to heart diseases
diseases” may have accelerated lung cancer research in tobacco studies as opposed to heart diseases. Furthermore, scientific uncertainty would become the choice weapon of the tobacco industry to malign scientific studies on tobacco and the scientists thereof.

The accused corporates used these gaps in knowledge to avoid huge financial loss, and to avoid categorization and regulation\textsuperscript{10}. The next section will discuss Phillip Morris’ attempt at creating “sound science” and “good epidemiological practices” by pushing toward more stringent standards of risk and confidence assessments. It was only in 1992 that Environmental Protection Agency declared tobacco smoke a Class A lung carcinogen (Brandt 2007, 306; Michaels and Monforton 2005, Glantz and Ong 2001; Golan 2012). The lobbying by corporate lawyers accentuated the tension in the relationship of law to science. In case of tort litigation it resulted in stricter standards of admission of scientific studies. Many tort cases were rejected on the basis of not achieving 95\% confidence intervals. Standards that were much higher than the ones used by physician to diagnose diseases and prescribe medicines (Michaels and Monforton 2005, S40). Judges were now the gatekeepers of science in the courts. Additional experts from other fields, such as history and social science, were garnered along with biostatisticians and experimentalist to verify as friends-of-the-court on the veracity of scientific evidence (See Proctor 2011 for detailed records). New criteria of falsifiability, testability, peer review, standardizations, and error rates were used to assess scientific evidence (Golan 2012, 177).

\textsuperscript{10} Several attempts were made by tobacco and hazardous chemical industries to challenge addition of certain carcinogens into the U.S National Toxicology Program
This chapter looks at the tobacco industry and its engagement with cigarettes in the twentieth century. Advertising and design were the early strategy of the industry to attract clientele and to steer public attention from the rising concern about the effects of cigarettes on users. The industry would go on to engage with the scientific community as a member and as its most potent critique. From such a perspective, it is possible to make the audacious claim that the industry played an important role, as motivator and obstacle, to strengthen the science of epidemiology and of tobacco. Ultimately, I argue that the industry, inadvertently, contributed to the aggrandizement of scientific community-public health-regulatory bodies’ alliance and its own loss of credibility through political lobbying and propaganda.

**Advertising Risk**

Tobacco industry’s advertising campaigns in some sense was a healthy prediction of the trouble that ensued in the mid-twentieth century. American Tobacco’s Lucky Strikes “Reason Why” campaigns in 1916 and 1925 illustrate some of the long lasting strategies of the tobacco industry: making dubious health claim, intense competition, promoting indulgence and targeting niche markets. “They’re toasted” was campaigned as a reason for the safety (from impurities) and mildness of Lucky Strikes (Brandt, The Cigarette Century: The Rise, Fall, and Deadly Persistence of the Product That Defined America 2007, 70). Philip Morris attained popularity as a woman’s smoke in 1933. Its claim, “Ask your Doctor about a Light Smoke”, sold the introduction of the humectant, diethylene glycol, to replace glycerin, which when
combusted produced acrolein (tear gas). Diethylene glycol produced a milder smoke and reduced the harshness of cigarettes though it still produced acrolein upon combustion (Proctor 2011, 175-76). By 1947, fears of the ill effects of tobacco were closing in on the industry when R.J. Reynolds’s campaign “More Doctors Smoke Camel than Any Other Cigarette” came out (Brandt 2007, 150).

The use of pseudo-scientific health claims to assuage the nervous smoker continued well into the 60s until advertising of cigarettes were banned. Concerns about the veracity of such claims came under repeated scrutiny of the FTC, only to be doused, temporarily placated or ignored. Moreover, the industry thrived on controversy and competition (also known as tobacco wars, 92). “It’s fun to be fooled” was R. J. Reynolds competitive retaliation to the Lucky Strikes pseudo-scientific claims of toasting.

The audacious slogan, “Reach for a Lucky Instead of a Sweet” (71) by Lucky, was the first campaign directed at women in a time when public smoking by women was deemed outrageous. The industry also sold cigarettes in tandem with current trends of beauty and fashion. Cigarettes were now a slimming agent for women as opposed to being a distant sexual allure in the hands of men. The slogan “Light another torch of freedom” by feminist Ruth Hale at the New York Easter Parade also came from American Tobacco’s envoys (84-85). For fifty decades, tobacco industry’s public relation and advertising “handymen” helped them stay ahead of the times, with

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1 FDA banned DEG in 1938 due to the controversy entailing DEG adulteration of anti-biotic called Elixir Sulfanilamide. Philip Morris consulted the editor of JAMA to ascertain the dangers of the use of DEG but was convinced that the use in cigarettes were different from that of drugs.
sharp feelers that were definitely more forward than their contemporaries in anti-tobacco campaigns and public health. This lasted until the 1970s. Many of the campaigns in 1920s and 30s used sport stars and film stars testimonies to advocate masculinity, sexuality, pleasure, camaraderie, affluence and style to the American public. The industry especially thrived in sexuality and gender norms. Philip Morris in 1953, amidst concerns of the dangers of cigarettes, revamped its campaign of filtered cigarettes\(^2\) as the smoke of “men’s men” (263). The image of the cowboy, The Marlboro Man and the jingle invited smokers to visit the Marlboro Country in 1962. This campaign made a lasting impression (which exists to this day) on the public (264). The advertisers of the industry used existing norms of consumption to promote indulgence. P. Lorillard’s Old Gold campaign in 1924 was the epitome of this conception of indulgence with its campaign to “Eat a chocolate. Light an Old Gold. And Enjoy Both” (93). Such that within three decades of its existence a cigarette was sold as just about anything ranging from medical properties of cigarettes, as stress reliever or cough syrup, to a slimming agent, aphrodisiac and candy (Brandt 2007; Proctor 2011). The Chesterfield’s generic campaign in the 1920s “They Satisfy” (Brandt, The Cigarette Century: The Rise, Fall, and Deadly Persistence of the Product That Defined America 2007, 77) sums up manufacturing of desire for a product that showed no other use value than replacing the effects of the last puff taken.

In some sense, cigarettes started with youngsters and ended with them too. The tactics used by Duke to allure youngsters in the late 19th Century is mentioned in an

\(^2\) Until then there existed a public perception that filter not only made cigarettes safe but also less authentic.
earlier section. The installation of Joe Camel, the cartoon figure of Camel, at Times Square in 1989 was a blatant display of the industry’s attempts to allure a particular niche markets, adolescents. Anti-tobacco campaigns, unlike in the time of Duke, were better equipped to deal with the industry at this point. A study showed that many children associated Joe Camel with figures such as Mickey Mouse. In late 1991, Janet Mangini, a family law attorney, for this blatant campaign, sued RJR. The resulting settlement and release of confidential documents in 1997 attested to the intentions of the campaigns (Brandt 2007, 7-10). A similar campaign by Brown and Williamson in 1933 merged health claims, folk medicine, racial mobility and equality with their penguin mascot and mentholated cigarettes. “Come Up to the Kool Taste”, “Smoking a Kool? Like riding a Rolls Royce” and “To be cool you smoke Kool” were extensively advertised in magazines that targeted the upward mobile African American populace, emerging from the Jim Crow era\(^3\). 90% of African-Americans who smoked, smoked mentholated cigarettes. Reverend Jesse Brown sued Brown & Williamson for niche targeting and economic racism, which was dismissed in 2001 by United States Courts of Appeals for the Third Circuit\(^4\). The injury caused by the addictive product, the fallacious advertising and defective design of cigarettes are an old story now with the release of documents through litigation and the unnamed

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\(^3\) For a detailed analysis of niche targeting and economic racism see Jain, "Come Up to the Kool Taste" : African American Upward Mobility and the Semiotics of Smoking Menthols, Spring, 2003

\(^4\) Interesting observation is that this injury claim was brought as a civil rights suit with substantial evidence but was dismissed because it fell out of the purview of the court’s judgment. It took decades of litigation for smokers to claim injury from tobacco products (296-98).
delivery of tobacco documents\textsuperscript{5} to Stanton Glantz at UCSF in mid-1994 (Glantz, et al. 1996). Until this time, the industry has had a free reign on more or less any change made to their design and ingredients, for which consumers have been guinea pigs (discussed later in this section).

Public Relations, Manufacturing Doubt and Responsible Corporations

In 1953, the tobacco industry made three strategic decisions that changed the face of the industry in the coming decades. First, they joined hands and hired a public relation firm, Hill and Knowlton (H&K)\textsuperscript{6}, to manage the controversy by managing print and visual media and walking the industry into the arena of scientific research. According to Oreskes and Conway (2010), this decision was to prove “fateful”, and would become the basis for the federal judge to find “the industry guilty of conspiracy to commit fraud” (15). Secondly, it drafted with H&K a “Frank Statement to Cigarette Smokers” (this act would continue in the future) reassuring them of the company’s good will and promising them the creation of a collaborative research that would further illuminate the nature of the controversy. Thirdly, they created the research entity, Tobacco Industry Research Council (TIRC) that re-named as Center for Tobacco Research (CTR)\textsuperscript{7}. This decision was widely publicized and was welcomed by both consumers and the scientific community.

\textsuperscript{5} This historical event was the decision of a single person that changed the image of tobacco industry in the public eye for good. In the light of this event, it is easier to understand why so many texts target the industry in their writings. This would not have been possible otherwise.
\textsuperscript{6} This partnership lasted for 15 years before it was terminated at the advice of the Policy Committee (lawyers) (Brandt 2007, 266)
\textsuperscript{7} This organization would also be dismantled and replaced by the Tobacco Institute (Brandt 1990, 249-51)
The tobacco industry’s already existing research funds cluttered the realm of scientific studies and sought to avert blame from tobacco⁸. Pertinent to this discussion is the inability to distinguish the inside and outside of this problem or of the industry. The influence tobacco industry had on academic research and scientists further blurs the division between “pure” scientific enquiry and science catering to tobacco controversy. Many of its beneficiaries knew of the connection, while others worked with naïveté characteristic of many in the academia. The irony of the whole event was that some strong cases for the tobacco-cancer link came from within the aegis of the industry. Ernst Wynder, himself, was a recipient of this funding (Proctor 2011, 201,205). The Sloan-Kettering Institute, NYU and Ecusta Papers had demonstrated, as early as 1953, the tobacco-cancer link through in vitro studies and chemical analysis (Oreskes and Conway 2010, 14, 17; Proctor 2011, 215-20). Internal consensus among the industry’s scientists on the carcinogenic nature of cigarette smoking existed as early as the fifties. Claude Teague, who worked as a chemist for R. J. Reynolds Company, in an exhaustive review of prior cancer research concluded the relation between the “incidence of cancer of the respiratory system” and increase of consumption of cigarettes “is more than a coincidence” (194). His work was unpublished, though he was later to become the Director of the Research and Design

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⁸ Many of the latter were funds towards forwarding genuine research on diseases, especially cancer, air pollution, ventilation and genetics, but it was also aimed to divert attention from the tobacco-cancer link. As early as 1941, the tobacco industry had recognized “the importance of biological research” (174). Medical College of Virginia at Virginia Commonwealth University was one its first partners that gave the industry two spokesperson in Harvey Bernhardt Haag and Paul Larson. It had beneficiaries in New York University, Duke University, Sloan-Kettering Institute and Memorial Cancer Centre of New York who received support from the tobacco industry funded Damon Runyon Fund.
Administration. Alan Rodgman, also at R.J. Reynolds, on studying the condensate of Camel cigarette smoke found thirty polycyclic hydrocarbons, including the known carcinogen benzopyrene. He then recommended the company to fund techniques of removing such particulates in cigarettes (Brandt 2007, 199-201). In 1958, Helmut Wakeham of Phillip Morris upon studying gas chromatography of cigarettes recommended the company to invest in “medically acceptable” cigarettes (201). He found forty distinct carcinogens in cigarettes smoke (341). The industry, instead, widely publicized the Frank Statements and the White Paper of documented scientific dissent.

In the early years of the controversy, the tobacco industry denied all scientific claims of linking smoking to cancer. They individually harassed scientists and their science, with much help from Hill and Knowlton, publicized, broadcasted and re-broadcasted counter-opinions, and aggressively advertised using skeptical doctors and entertainers. The long haul strategy of the industry was “cherry picking” of scientists, who were vocal skeptics, and of the problems within science studies (Oreskes and Conway 2010, 18). They separated out elements of studies, such as short-intense exposure studies in laboratories experiments, extrapolation and lack of inter-species knowledge in in vitro studies, causal inference, recall bias, lack of specificity and chance occurrence in statistical evidence, the crude methodology in the use of

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9 He later contributed to the filter jargon, by increasing pH levels of filter such that they changed color upon being smoked, a visual form of placation for smokers, helped Phillip Morris in ammoniating tobacco sheets, and R. J Reynolds with long-term planning. He also suffered from an incidental case of amnesia when the document was divulged in 1997-98, as the result of the long litigation process of Minnesota v. Phillip Morris (Pro 193-199. Brandt 199, 244-245).
spectrograph, chromatography, pathology and data, and so on. The criticisms parsed out elements of a single research even when the methodology was sound and peer-reviewed, and when scientists corroborated their works with other studies. By 1950s, in the light mounting evidence it was impossible to continue denial especially in the eyes of consumer. In spite of which, for decades, the industry worked towards “keeping the debate alive” and “maintaining controversy” (241) with Hill and Knowlton managing information and media in such a way as leave “no fingerprints” (Brandt 2007, 167). In the succeeding decades, the public relations group would inevitably use the motive of freedom of press, the Fairness doctrine, which requires the explanation of both sides of a controversy “to better inform” citizens, and individual freedom to choose, without the fear or paternalism of government, against critiques and to the consumers. All this was an attempt to appear as a responsible corporate citizen in the eyes of the American subject while maintaining credibility of the “lack of proof” (Oreskes and Conway 2010, 245-47; Brandt 2007, 193). However, the use of these doctrines of right violated the very heart of the doctrine. The industry’s use of airtime and manipulation of media, with a large number of disparate studies and opinions, pull opinion polls as feelers, and the use of science was very different from the doctrines themselves. It goes to show how money, political influence, persistence and a loud clamor can cloud the public more than fair play.

“Manufacturing uncertainty”, “manufacturing doubt”, “junking science” were the terms used by much of academia to describe the strategies employed by the industry against science (Glantz and Ong November 2001 1751-54; Michaels and
The success of these strategies enabled the industry to claim “doubt is our product”, and in turn they were replicated by many chemical and hazardous substances, and pharmaceutical industries, in the following years, to avoid litigation and regulation. More often than not, the strategy involved junking the scientist, as “hysterical” and “emotional”, or as doomsday conspiracies (Oreskes and Conway 2010, 220, 256-58). The process of junking continued even as the Surgeon General’s Report confirmed the harmful effects of smoking on health in 1964. Although many of the industry’s strategies ultimately failed, it worked a long way to delay litigation and regulation of cigarettes. The industry’s involvement in the construction of epidemiological standards attests to the desperation to avoid classification as a drug, carcinogenic or “risky substance”. As long as tobacco remained in the realm of cash crop, recreational and non-essential consumer product it could avoid scrutiny from regulatory agencies (such as FDA). Moreover, the industry enjoyed the indirect protection afforded to it by the United States Department of Agriculture (USDA), in their support for the tobacco farmers.

Phillip Morris, in the 1993, would go on to fund “sound science’ programs and “good epidemiological practices” through The Advancement of Sound Science Coalition (TASSC) to control scientific practices and to evade blame. Phillip Morris had created Smoker’s rights groups, bill of rights and websites (such as junkscience.com) in the wake of studies proving the harmful effects of second hand smoke. Under the cover of TASSC it now conducted multiple international conference across the globe to increase skepticism, to manipulate risk management practices (failed attempt but efforts were made to increase risk ratios to > 2 and confidence levels to 95%) and created the terms like “bad science”. It also shows the move from creating controversy and uncertainty and independent research to direct manipulation of the practices of science (Ong & Glantz, 1751-1754).
Tricky Design: The “Thermodynamic Impossibility” of filters

The industry dabbled with design variations and reassurances in the event of scientific evidence linking tobacco to chronic diseases. However, most of these design variation were limited to minor changes that did not require compromising profit or significant effort from the part of the industry. There still exists literature that suggests that in spite of their culpability and audacity the industry was worried by the ample evidence against cigarettes. A blanket denial and hope for redemption existed beyond public relation strategies. Ultimately, the lethality of cigarettes was also the selling point (addictive) of cigarettes that kept the customer loyal. Today, one sees the possible dissociation of the two contradictory qualities of cigarettes in vaporizers, nicotine patches and gums but they still do not replace cigarettes for most users.

Design variations included “light” cigarettes, “safe” cigarettes and filters, touted during the phase popularly known as the “tar derby” (Brandt 2007, 244-45). The design research and marketing of low-tar cigarettes began in the 50s (Proctor 2011). The paradoxical nature of tobacco, which I use to understand the constraints imposed by things on the so-called human realm of social, is well illustrated by the “tar derby”. Soaking the plant in water or ammonia alters nicotine content, the primary chemical alkaloid and addictive substance in tobacco. German scientists proved this as early as 1940s; whereby 5% of the tobacco harvest was nicotine free (Proctor 2011, 341). However, the irony in this early finding is that smoking was in the first place a delivery mechanism for nicotine. Smokers, as consumers, returned to buy cigarettes to

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11 See footnote 9 to understand the use of visual perception to placate smokers
replenish nicotine levels in their system. The failure of high nicotine cigarettes were that no smoker was capable of drawing more than a certain amount of nicotine into his or her bodies at a time. People complained of “distortion of flavor” similar to “burning rubber”, other fell ill (362).

The low-tar and filters cigarettes posed the problem of compensation. Compensation is the physiological tendency of the smoker to inhale harder when nicotine delivery is restricted. The research and manufacture of filter experimented with almost every possible substance and combinations. In the 1930s and 40s silica gels, wool, cotton, porous clay were used to make filters. Some of the more famous substance were activated charcoal, cellulose acetate, chlorophyll, crocidolite asbestos, dried cheese, and tobacco. The Kent’s “micronite filters” was a campaign that extended from 1952-1956 using filters containing crocidolite asbestos. Because of this innovation, several of Kent’s factory workers, who inhaled the fumes, and Alexander Spear III, the head of research, contracted mesothelioma from exposure to asbestos. The product existed in the market even after Kent revoked the manufacturing of micronite filters (Proctor 2011, 343-345, 352). Several physiological variations were also researched to make filters grooved, perforated, and crimped. They were advertised using clinical and highly technical terms, including “double barrel health protection”, “dual filtration”, “health guard”, “gas trap”, “multi-jet”, suggesting purity and safety. Even phrases like “snow white” were used to denote purity (Proctor 2011, 345, 351-52). When the industry researchers were not trying to defy laws of thermodynamics with their research on selective filtration of tar, the smoker
confounded them. Smokers pulled harder, squeezed perforated filters, and rejected low-nicotine products, tight filters and altered flavors (350). The industry continued with filters, partially out of naivete and partially to manipulate the smoker, but mostly because it proved to be lucrative\textsuperscript{12}. Several chemical additives and accelerants were also tested to make the cigarette burn faster and at a higher temperature. However, for every new breakthrough a new carcinogen or defect complicated the research finding. Ultimately, the long-term solution adopted by the industry was to shake hands on an oath of silence and continue its manipulation of consumers.

Design variation and research were used to cloud the minds of consumers. Alternatively, as Jain claims it was a technological fix for a problem caused by technology and consumption, or as Oreskes and Conway call it, a form of “technofideism” (2010, 260). One can venture to say that some of their marketing techniques are still used by smokers and non-smokers to deny effect of smoking on health. Or as Brandt claims, “it appealed to the hopes of smokers eager to maintain a highly addictive behavior and embrace the allure, in a technological age, of a technological fix” (Brandt 2007, 245). The “tar derby” in one way attests to the century long growth of advertising, one that raised concern among public health over its veracity and its effect on the public.

\textsuperscript{12}The filters made cigarettes sturdier and saved on tobacco for the portion occupied by filters
Conclusion

The project is an exercise in asserting the role of a non-human actor, tobacco into the history of tobacco (ironically): a history weaving together the political, socio-cultural, geographical elements into a complex ecosystem. At the center of this ecosystem lie the tobacco plant and the result of human intervention on the plant, cigarettes. Their location at the center is to emphasize their pivotal role in shaping this history without granting them the place of singular causal agency. On the other hand, the project highlights the role played by tobacco as panacea, cash crop, mass-produced, recreational, consumer product and a carcinogenic drug in organizing and shaping the institutions and discourses through which they traversed. Alternatively, one can say it highlights how particular material constraints can be given space to express their effect within a socio-cultural framework.

As mentioned earlier, I use Latour’s Actor Network Theory (2005) and idea of controversy (1987) to understand the history and emergence of the phenomenon, cigarette smoking, that involve both human and non-human actors. The action of objects seem incommensurable to actions of humans and the collective, only when intentionality is at stake (Latour 2005, 74-75). However, objects or things are vital as constraints to understanding any phenomena. A study of human-to-human interaction or object-to-object interaction as “reflexive” and “symbolic” and “material” and causal” does not help one understand this complex ecosystem. Assemblages of different actors, human and non-human, are required to gauge the complex formation of the social (Latour 2005, 75). The agency of objects should be acknowledged
whether it is to understand bacterial action or gun control. The movement of and interactions between humans and non-humans across history have allowed for a better understanding of the causes of discontinuity, accidents and constraints. I admit that the theoretical extent of my project is highly limited with only basic concepts like actors, controversies and risk used to engage with tobacco’s history in the United States of America. However, this sparse format as mentioned earlier performs two key functions: chip away at human intentionality while reinstating non-human actors, accident and contingency into the historical narrative. I purposefully do not differentiate between perception, discourse, institutions, humans and material for the same reasons. They interweave and co-constitute one other.

To summarize once again, this project looks at how tobacco as a cash crop shaped English colonial and settlement in the United States. The project speaks to the formation of the tobacco gentry and of a moral discipline of farming that organized hierarchies in Chesapeake and in the new frontiers. Tobacco was not the sole causal factor but a nodal link that interacted with other institutions in a co-constitutive relationship. Over the course of years, both tobacco and the community changed as did the legislative and natural environment. The rise of mechanization and industries have now further changed forms and agents of surveillance of tobacco cultivation but a moral discipline of cultivation still orders the world of farmers, albeit in a different form. Similarly, the historical confluence of several events, and environmental and human intervention, in turn, gave rise to a specific kind of tobacco. This particular kind of tobacco- the flue-cured, bright yellow Virginia tobacco that thrived in the
sandy loose soil of Piedmont—was best suited for cigarettes, and contributed to the allure, pleasure, addiction and lethality of cigarettes (as opposed to cigars and snuff).

The irony of cigarettes is as deep as its chemical structure, whereby nicotine and pleasure are dependent on the lethality of tar. In certain ways, it is an example of “planned historical accidents” (that is, it is neither fully planned with a teleological end nor is it fully accidental). This irony further manifests in the “tar derby” or the attempt of the industry to control tobacco to its benefit. This narrative while being one of control and manipulation also illustrates excess of qualities that defy particular intentional action of the industry.

In this sense, I de-emphasize in the history of tobacco/cigarettes what in other works has been the major highlight—corporate paternalism and industrial fraud—to show that material constraints and qualities emerge in the interaction of actors and is not constituted through a determinate causality in a single direction. This de-emphasis works not to undermine the power of money, political lobbying, willful suppression and manipulation of information. Their influences sustained the controversy for decades and now produce new forms of hierarchies and domination. However, the very source of the industry’s profit, tobacco, often elided their manipulation and strategies while sustaining them. Moreover, in spite of the influence of the industry contradictory results, such as public health regulations, collectivization of the scientific community and litigation cannot be explained by resorting to corporate power alone. Furthermore, in many ways the anti-tobacco reflects the language of choice and will used by the industry to dissuade the user.
It is here the choice of looking at material actors becomes pertinent. To impute god-like agency and intentional action to the industry’s behavior does two things. Firstly, it undermines the addictive chemistry of tobacco and the affective allure of cigarettes\(^1\) to its users, portraying it as nothing more than the effect of public relations\(^2\). Secondly, it reproduces the ideology that allows a platform for the industry’s argument that smoking is an individual right and a matter of individual choice. If smoking was only a reflection of advertising skills then it can be exorcized or fade out from the mind like an old commercial. Alternatively, as Philip Morris’ campaign suggests, the regulation should begin at home. A political project of the industry displaces blame from themselves on to users and their families. What the agency of industry has indeed worked towards is to make the product ubiquitous, behind counters at pharmacies and supermarkets, especially to certain target populations. Furthermore, concentrating on the agency of the industry overlooks the effect of the interaction between various institutions such as agriculture, science of tobacco, public health and law in the 20\(^{th}\) Century. How in spite of the industry tobacco smoke is now classified as a Class A carcinogen (Brandt 1990) and how emergence of quality control and surveillance of farmers occurred is inadequately explained by concentrating on the industry.

I argue that the rise of epidemiology in the early decades of the 20\(^{th}\) Century went a long way in illuminating the carcinogenic nature of cigarettes. It was a paradigm shift of sorts within science addressing a lacuna. The lacuna was both

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\(^1\) As an extension of their bodies, as markers of movement, time and space and the various forms in takes in usage (Jain, 2006)

\(^2\) If so then how do some people get hooked while others don’t even give smoking a thought.
epistemic and pragmatic, and affected scientific practice for decades. It above all attests to the shortcomings of experimental science and its discrete categories of disease. However, I also contend that a number of other occurrences- the prosperity and laissez-faire economy in the post-War era, the rising consumer culture and individualism, the form and design of the cigarettes, rise of chronic ailments like cancer, and the earlier efforts of anti-tobacco campaigns and scientific studies- also contributed to make scientific studies of the effects of tobacco pertinent. More importantly, the tobacco industry with its persistent denial, fraud, “cherry picking” and alternate research in an antithetic turn bolstered the shaping of a “community of scientists” and attracted the attention of public health institutions. This cognizance in turn converted to an extent the very nature and function of public health bodies in the States. Ultimately, tort and injury laws, in an increasingly homogeneous consumerist environment, also influenced scientific practice. When politics, policy-making, corporatism and stakes weave in, whether it is of the government, tobacco industry or legal and regulatory organs even the sacrosanct analytic boundaries of science studies are blurred.\footnote{Experienced by me when trying to parse relevant criticism and contrary studies to the tobacco-cancer that could be efficiently separated from vested-interest of tobacco industry}

**A Short Note on the Risk and Situated Practices**

I acknowledge two other consequences of this study. Science played a major role in shaping perception of risk and risky behavior, which has radically changed in the case of smoking in 1964. Perception of risk is specific to particular societies (higher in countries like USA) and particular forms of consumer capitalism. Risk also
specifies a mode of interaction between human and non-human objects. Law, policy, public health and science often becomes the go-to institutions to lay out the terms of interaction (From moderation to de-addiction). According to Jain, these dictates differ from actual form of interaction with object, which are more mundane and fluid practices. The language of expertise of these dictates further redistributes risk in society, which Jain (2006) claims are often drawn along already existing divides.

Another important consequence of the relation between epidemiology and tort laws are the products (cigarettes) themselves. Jain (2006) refers to this aspect as design, which alters the mode of interaction between human and non-human objects. Design of products account for an average user and in turn create new kinds of users, who interact with products. Injury marks the moment of disjuncture between the product and its users. A “negligent manufacturer” also entails a “negligent consumer” (25). The pertinence of the design of cigarettes is discussed in Chapter 6 of this paper.

As cigarettes became political actors in the courts with affects that can injure the user and others, it effectively physically and discursively altered the user, interpellating them in new circuits. In many such avenues, smokers become the icon of the risky individual. More importantly, the smoker defines her own self and subjectivity in terms of risk, whether to denote rebellion or to assert guilt of self-destruction and lapse of agency.

The claim of universal rationality of science, utilitarian principles of public

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4 Expert opinions and technical knowledge often require education of a particular sort and accessibility which are in turn differentially distributed along racial and ethnic lines
5 Latour’s (1987, 1991) notions of human-non-human networks and the resistance of provided by material substance may shed light on some of these concerns
6 Including potential candidates for cancer wards and as poor candidates for insurance companies
health and clinical precision of law, here, come up against the block of individual variations along racial and ethnic lines. To avoid reifying cultural, political and geographical distinction it is important to view science, public health and law as a historical and situated practice, which takes cues from the society it resides in. The answer, therefore, is not to then concentrate only on culture or ethnicity (Nichter 2003; Jasanoff 1986) for that fortifies cultural differences to ignore the obvious, material constraints, corporate paternalism, consumer capitalism and disparate governmental organisation in the United States of America.
Bibliography


Nichter, Mark. "Smoking: what does culture have to do with it?" *Addiction, 98 (suppl 1)*, 2003: 139-145.


